

**PHASE II
ENVIRONMENTAL SITE ASSESSMENT**






5 Bells Neck Road
Map 10 Parcel G1
West Harwich, MA 02671
Project #BEA10-10288

MARCH 10, 2011

BENNETT ENVIRONMENTAL ASSOCIATES, INC.

LICENSED SITE PROFESSIONALS  ENVIRONMENTAL SCIENTISTS  GEOLOGISTS  SANITARIANS

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EMERGENCY SPILL RESPONSE  WASTE SITE CLEANUP  SITE ASSESSMENT  ENVIRONMENTAL PERMITTING  LAND USE PLANNING
WATER SUPPLY DEVELOPMENT, OPERATION & MAINTENANCE  WASTEWATER TREATMENT, OPERATION & MAINTENANCE

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Prepared for:

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Prepared by:

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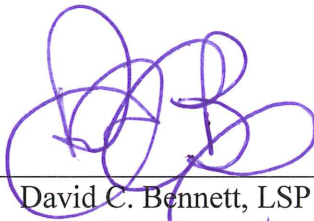
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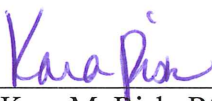
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I certify that this Phase II ESA was conducted under my direction and supervision. I further certify that I have reviewed and approve this report, and the methods and procedures employed in development of the report conform to industry standards in the market as of this date.



David C. Bennett, LSP
President



Kara M. Risk, RS
Senior Project Manager



Date

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1.0 Executive Summary

1.1-1.2 Purpose/Introduction, Scope of Services/Methodology, Findings

This report presents the results of the Phase II portion of an Environmental Site Assessment (ESA) performed by BENNETT ENVIRONMENTAL ASSOCIATES, INC. (BEA) on behalf of Bob Cafarelli of the Town of Harwich Engineering Department. The Phase I was completed to address the Recommendations made by BEA in the December 14, 2010 Phase I Environmental Site Assessment (ESA) with Limited Physical Testing for the Subject Property at 5 Bells Neck Road in Harwich, MA. The Findings of the Phase I report identified numerous Potential Environmental Conditions (PECs) including 1) a metal object off the northeast corner of the building which could not be identified, 2) the hydrologically upgradient presence of a cemetery directly abutting the Subject Property to the south, 3) the presence of a hydrologically downgradient property [Pinewood Village Condominiums (PVC)] which has asserted Downgradient Property Status (DPS) for the presence of chlorinated solvents, as well as petroleum, in their former public water supply well and on-site monitoring wells, and 4) the hydrologically upgradient presence of a known active Disposal Site for the release of chlorinated solvents as related to former on-site dry cleaning operations. A Historic Recognized Environmental Condition (HREC) was also identified as associated with the documented migration of a solvent plume through the area of the Subject Property [Refer to "Site Investigation Report – Harwich PCE/TCE Study Area" prepared by SAIC Engineering, Inc. (SAIC) and dated March 2003 in Appendix B].

Based on the aforementioned PECs and HREC, BEA recommended the further investigation and identification of the metal object off the northeast of the subject building, a file review at the MA DEP relative to the DPS filed for PVC and the sampling of select existing wells at PVC for volatile organic compounds (VOCs) in review of current environmental conditions, and the installation and sampling of a monitoring well couplet at the Subject Property for VOCs and formaldehyde impacts.

On January 18, 2011, BEA conducted a file review at the MA DEP Southeast Regional Offices in Lakeville, MA. Files reviewed were associated with the downgradient Site at Pinewood Village Condominiums and included an "Immediate Response Action (IRA) Completion Report" prepared by KEY Environmental Services, Inc. (KES) dated January 18, 1998, "Supplemental IRA Completion Report" prepared by KES dated August 18, 1998, and "Downgradient Property Status Opinion" prepared by KES dated February 16, 1998. A report titled "Site Investigation Report – Harwich PCE/TCE Study Area" prepared by SAIC Engineering, Inc. (SAIC) and dated March 2003 was also provided for review [Refer to Appendix B].

Data reviewed in these reports was used in determining which of the existing PVC monitoring wells to sample in review of current environmental conditions in this downgradient location. Based on the historical report of chlorinated solvent impacts in the existing MW-1, screened at 50' below grade surface (bgs) and located some 52'(+/-) to the northeast, this monitoring well was selected for VOCs analysis. In addition, based on its near proximity to the Subject Property, as some 16' off the northeast corner of the subject building, MW-5, screened at 30' bgs, was also selected for VOCs analysis.

The Subject Property was properly marked out and cleared for utilities by Dig Safe and on January 27, 2011 BEA was joined on-site by Jenkins Well Drilling to conduct test borings (TB) and install two monitoring wells [BEA-1S (shallow) and BEA-1D (deep)]. The location of the test borings was based on the assumed northeasterly groundwater flow direction, as downgradient of the documented release at Dennisport Automatic Coin Laundry, and upgradient of formerly documented groundwater impacts at PVC. This location was also in near proximity to the southerly abutting cemetery in review of groundwater impacts from embalming fluids.

Test boring TB-1/BEA-1S was advanced to a depth of 21' below grade surface (bgs), while TB-1/BEA-1D was advanced to a depth of 46' bgs. A soil sample was collected at the final depth of BEA-1D. The sample was placed in 250-mL glass jar and sealed with aluminum septa. The jar was agitated to develop organic vapors and the soil sample was screened in the field with a photoionization detector (PID) for total organic vapors (TOV) by "jar headspace" method as consistent with the MA DEP "Interim Soils Policy..." WSC 94-400. The soil samples reported a TOV concentration of 2.5 ppmv. With groundwater encountered at 12' bgs, a 10' PVC screen was set at 21' bgs at monitoring well BEA-1S, while a 10' screen was set at 46' bgs at BEA-1D.

On January 28, 2011 the newly installed monitoring well couplet (BEA-1S/D) as well as MW-1 and MW-5 at Pinewood Village Condominiums was developed, purged and sampled for VOCs via Method 8260B. BEA-1S was also sampled for formaldehyde in review of potential groundwater impacts from the adjacent cemetery and total petroleum hydrocarbons (TPH) in review of the historical presence of TPH reported at PVC. Each of the samples was field preserved with ice in a cooler and submitted to Groundwater Analytical Laboratories, Inc. on a priority turnaround for MA Certified analysis.

While on site, the aforementioned metal object identified off the northeast corner of the subject building was investigated. Upon further review, a metal tank was discovered beneath the building. Physical evidence indicates that the tank pre-dated the centralized plumbing of the building and that the vessel was intentionally located below the area of the bathrooms and sinks as a septic appurtenance. Additionally, the construction of the vessel is typical of a metal septic tank, rather than a fuel storage tank. What appeared to be the remnants of a second tank were also noted to the east of the vessel. A portion of this second tank extended beyond the foundation wall. It was noted that the metal object observed off the chimney at the northeast corner of the building was associated with a porthole to the secondary tank.

A 1' composite soil sample was collected off the east end of the bottom of the primary tank [BOT(E)] for field screening. In addition, a hand boring (HB-3) was conducted outside the adjacent north foundation wall to some 13' bgs, with groundwater encountered at 12'bgs. While field screening indicated no significant impacts with all TOV concentrations ≤ 0.5 ppmv, in order to fully qualify any significant impacts associated with the existing and/or former tanks, soil samples BOT(E)@1' and HB-3:10-12' were prepared, as was a Tank Sludge sample as representing the current contents of the existing vessel, and

forwarded to Groundwater Analytical for confirmatory total petroleum hydrocarbon (TPH) analysis.

Laboratory analysis dated February 4, 2011 reported a TPH concentration of 76mg/Kg in the Tank Sludge sample, identified as within the lubricating oil range. The HB-3:10-12' and the BOT(E) @1' soil samples reported TPH as below the reporting limit (BRL) of the analyses. Both the reported TPH concentration in the sludge and the reporting limits for HB-3:10-12' and BOT(E)@1' are well below the applicable RCGW-1 Reportable Concentrations and the GW-1 Method 1 – Risk Characterization Standards. As such, none of the soil or sludge samples submitted represent a material threat of release to the property, nor notification nor remedial response liability for the property owner.

Laboratory analysis reported chlorinated solvents impacts exceeding the applicable RCGW-1 and GW-1 Method 1 Standards in groundwater at BEA-1D with tetrachloroethylene (PCE) at a concentrations of 260ug/L and trichloroethene (TCE) at 25ug/L. No VOCs, formaldehyde nor TPH impacts were reported in monitoring well BEA-1S. This data documents that the chlorinated solvent impacts are present in the deep aquifer but not in the shallow aquifer, indicating the source as being some distance from the Subject Property. Furthermore, this data absolves any potential impacts associated with the abutting cemetery or any significant petroleum-related impacts from the tanks identified beneath the subject building or from an off-site source. PCE was reported at a concentration of 9ug/L, as exceeding the RCGW-1 and Method 1 GW-1 standard of 5ug/L, in MW-1 located at the PVC property. No groundwater impacts were reported in the VOCs testing at the PVC monitoring well MW-5. As such, it is noted that the chlorinated solvent impacts documented in 1997 persist at concentrations above the RCGW-1 and Method 1 GW-1 standards at the northerly and easterly abutting property as well as the Subject Property, as attributed to RTN 4-12832. It should be noted that, wherein the subject building is boarded up and vacant with no utility service, no current exposure pathways exist and no Imminent Hazard conditions are present for the Subject Property.

1.3 Findings

In communications with Mr. John Handrahan of the MA DEP, it has been confirmed that Release Notification liability is not warranted under 310 CMR 40.0317(16), wherein release notification has been provided to the Department for the Disposal Site as the identified source, a response action is being undertaken, and the groundwater impacts identified at the Subject Property are consistent with those for which notification has previously been made to the Department [Refer to Appendix B].

Furthermore, the Department has confirmed that the Town is not required to file an Assertion of Downgradient Property Status (DPS) to be afforded the liability protections under the MA General Law, Chapter 21E, Section 5D, wherein 1) groundwater impacts were released from an upgradient source (Dennisport Automatic Coin Laundry is the sole identified Potentially Responsible Party (PRP) upgradient of the Subject Property), 2) the Town did not and does not own or operate the Site from which the source of the release originated, 3) the Town has complied with the notification requirement in accordance with 310 CMR 40.0317(16), and 4) the Town will provide reasonable access to the Subject

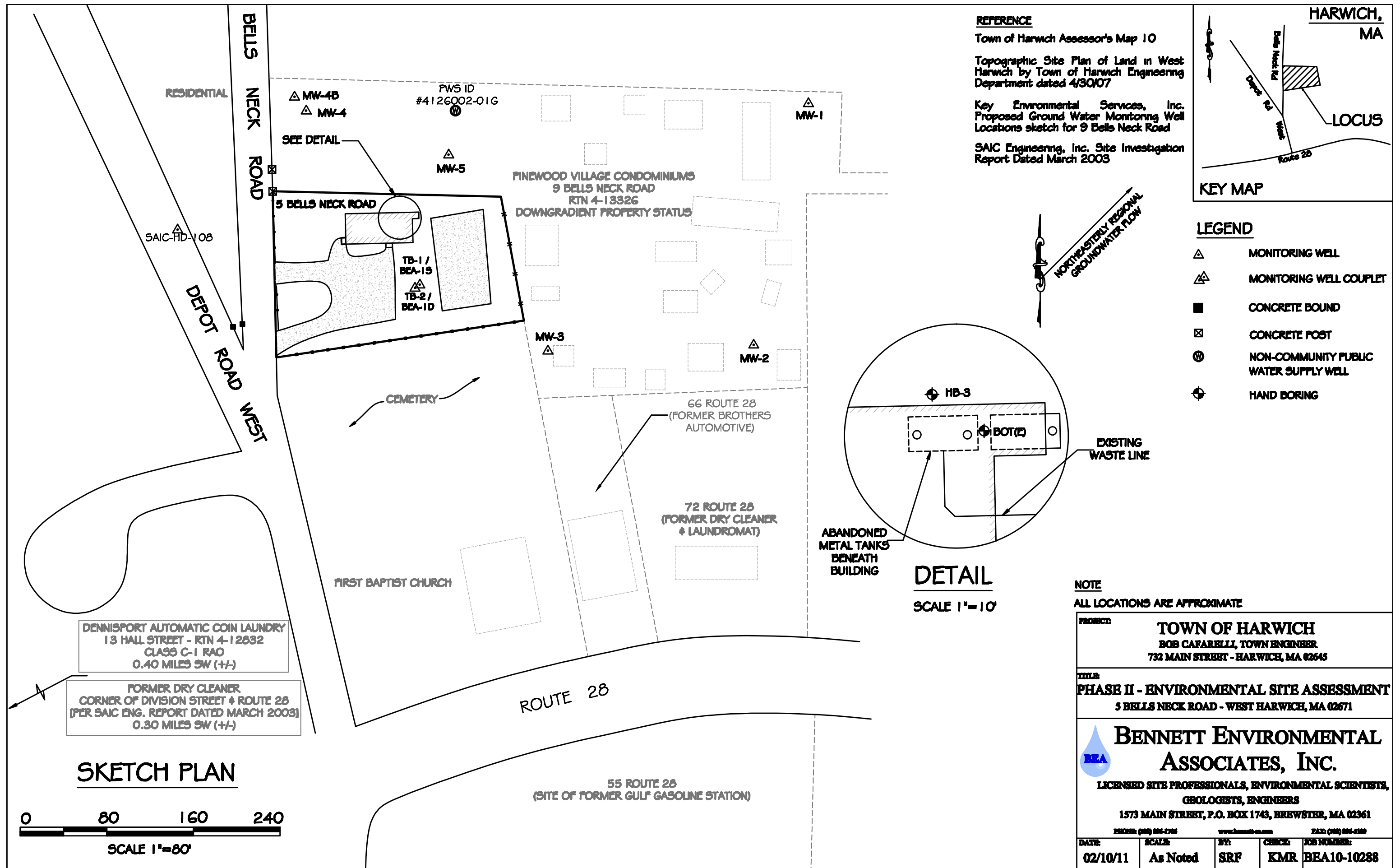
Property, take reasonable steps to prevent exposure to groundwater impacts and/or Imminent Hazard conditions, will not reasonably impede or interfere with the performance of response actions, and will not exacerbate the release [Refer to Appendix B].

1.4-1.5 Conclusions/Recommendations








- The Town of Harwich is categorically not liable for response action costs in the absence of filing a full Assertion of Downgradient Property Status. BEA does recommend, however, that the Environmental Site Assessment (ESA) reports prepared by BEA be forwarded to the MA DEP to document our discussion with the Department relative to regulatory procedures under the MCP and to frame these apparent protections afforded under Chapter 21E.
- The presence of chlorinated solvent impacts over a large area of West Harwich has long been identified and attributed to the Dennisport Automatic Coin Laundry Site, for which a number of DPS filings have already been made. Mr. Handrahan has indicated that the MA DEP would investigate the responsibility of the identified Responsible Party to monitor exposure risks and cleanup under their Remedial Response Performance obligations and to consider the validity of claims for secondary sources. In the interim, BEA recommends Level 3, Ambient Air Quality testing within the existing structure at the Subject Property to evaluate any potential Imminent Hazard or Significant Risk of organic vapor entry into the building or future structures if site redevelopment or reoccupancy is intended within the next 12 month.

**Massachusetts General Law, Chapter 21E, states that the property owner may be legally and financially liable for the presence of any hazardous material or petroleum product present on their property, in the groundwater beneath their property, or in subsurface materials. The owner of the property on which the release has occurred is legally required to notify the Massachusetts Department of Environmental Protection about the discovery of such materials in excess of the prescribed concentrations or quantities and contract a Licensed Site Professional to supervise remedial response actions.

APPENDIX A



APPENDIX B

BENNETT ENVIRONMENTAL ASSOCIATES, INC. 1573 Main St., P.O. Box 1743 Brewster, MA. 02631			Project Name: <u>Town of Harwich</u> Project Location: <u>5 Bells Neck Road, W. Harwich</u> Project Number: <u>BEA10-10288</u>			Sheet <u>1 of 2</u> Boring No. <u>TB-1/BEA-1S</u> Location <u>SE of building</u> Surface Elev. <u>13'</u> Start Date <u>1/27/2011</u> Finish Date <u>1/27/2011</u> Driller <u>Jenkins</u> Inspector <u>JTW</u>										
Groundwater Readings <table border="1"> <thead> <tr> <th>Date</th> <th>Reading</th> </tr> </thead> <tbody> <tr><td>1</td><td></td></tr> <tr><td>2</td><td></td></tr> <tr><td>3</td><td></td></tr> </tbody> </table>			Date	Reading	1		2		3		Casing Sampler Core Type _____ Size I.D. _____ Hammer Wt. _____ Hammer Fall _____					
Date	Reading															
1																
2																
3																
Depth	Sample type-No.	Sampling Depth (ft)	Inches Pen Rec		Blow Count 6"			TOV Reading	Soil Description	Well Specs	Interpreted Geology					
	A	0 - 1'	NA	NA	NA	NA	NA	NA	Topsoil/Subsoil							
5-ft	A	1' - 10'	NA	NA	NA	NA	NA	NA	Sand: Brown, medium to fine grain, moderately sorted.							
10-ft	A	10' - 15'	NA	NA	NA	NA	NA	NA	Sand: as above.							
15-ft		15' - 17'	24	20	4	4	5	6	ND							
20-ft																
25-ft																
30-ft																
35-ft																
40-ft																
45-ft																
 Sand  Gravel  Silt  Top/Sub Soil  Clay  Peat  Fill		<u>Cohesive Soils</u> < 2 = very soft 2-4 = soft 4-8 = medium stiff 8-15 = stiff 15-30 = very stiff > 30 = hard	<u>Granular Soils</u> < 4 = very loose 5-10 = loose 11-30 = medium 30-50 = dense > 50 = very dense	<u>Sample Type</u> SS - split spoon ST - shelly tube AF - auger flights RC - rock core MA - microliners HA - hand auger	SWL: 12' (+/-) NOTES: Set monitoring well at 21' bgs. Backfill with clean sand and set 2' bentonite plug 2' above 10' of #20 slot 2" Sched 40 PVC screens.											

**BENNETT ENVIRONMENTAL
ASSOCIATES, INC.**1573 Main St., P.O. Box 1743
Brewster, MA. 02631Project Name: Town of Harwich
Project Location: 5 Bells Neck Road, W. Harwich
Project Number: BEA10-10288Sheet 2 of 2
Boring No. TB-2/BEA-1D
Location SE of building
Surface Elev. _____
Start Date 1/27/2011
Finish Date 1/27/2011
Driller Jenkins
Inspector JTW

Groundwater Readings	
Date	Reading
1	
2	
3	

Type	Casing	Sampler	Core
Size I.D.			
Hammer Wt.			
Hammer Fall			

Depth	Sample type-No.	Sampling Depth (ft)	Inches		Blow Count 6"				TOV Reading	Soil Description	Well Specs	Interpreted Geology
			Pen	Rec								
5-ft	A	0 - 1'	NA	NA	NA	NA	NA	NA	NA	Topsoil/Subsoil		
10-ft	A	1' - 10'	NA	NA	NA	NA	NA	NA	NA	Sand: Brown, medium to fine grain, moderately sorted.		
15-ft	A	10' - 15'	NA	NA	NA	NA	NA	NA	NA	Sand: as above.		
20-ft		15' - 17'	24	20	4	4	5	6	ND	Sand: as above.		
25-ft	A	20' - 30'	NA	NA	NA	NA	NA	NA	NA	Sand: as above.		
30-ft												
35-ft	A	30' - 40'	NA	NA	NA	NA	NA	NA	NA	Sand: as above.		
40-ft												
45-ft	A	40' - 45'	NA	NA	NA	NA	NA	NA	NA	Sand: as above.		
	A	45' - 46'	NA	NA	NA	NA	NA	NA	2.5	Sand: Brown, fine grain, well sorted, to brown fat clay at 46'.		
	Sand		Cohesive Soils		Granular Soils		Sample Type		SWL: 12' (+/-)			
	Gravel		< 2 = very soft		< 4 = very loose		SS - split spoon		NOTES:			
	Silt		2-4 = soft		5-10 = loose		ST - shelly tube		Set monitoring well at 46' bgs.			
	Top/Sub Soil		4-8 = medium stiff		11-30 = medium		AF - auger flights		Backfill with clean sand and set 2' bentonite plug 2'			
	Clay		8-15 = stiff		30-50 = dense		RC - rock core		above 10' of #20 slot 2" Sched 40 PVC screens.			
	Peat		15-30 = very stiff		> 50 = very dense		MA - microliners					
	Fill		> 30 = hard				HA - hand auger					



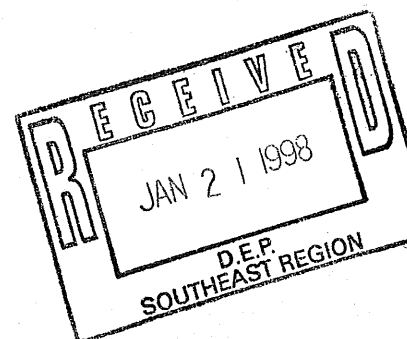
KEY Environmental Services, Inc.

379 LIBERTY STREET

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TEL 781/871-8552

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**IMMEDIATE RESPONSE ACTION
COMPLETION REPORT**

**Pinewood Village Condominiums
9 Bells Neck Road
West Harwich, Massachusetts**

**Release Tracking No. 04-13326
KEY File No. F436**

Prepared For:

Pinewood Village Condominium Association
c/o Irving D. Weiner, President
23 Laurel Road
Sharon, MA 02067

January 18, 1998

1.0 INTRODUCTION

On behalf of the Pinewood Village Condominium Association, KEY Environmental Services, Inc. (KEY) has completed an Immediate Response Action (IRA) which was presumptively approved by the Department of Environmental Protection (DEP). The IRA was mandated by DEP via the Notice of Responsibility (NOR) With Interim Deadlines, dated September 18, 1997 for the property referenced as the Pinewood Village Condominiums, located at 9 Bells Neck Road in West Harwich, Massachusetts, DEP Release Tracking No. 04-13326 (the site).

The NOR addressed a known release of volatile organic compounds (VOCs) at the site which exceeded the allowable Massachusetts Contaminant Levels for drinking water. Certain contaminant concentrations detected exceeded their current Reportable Concentrations (RC) for a Groundwater Category 1 (RCGW-1) established in the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000.

A "DO NOT USE ORDER" - Administrative Order (UAO-SE-97-5003) was issued by the DEP to the Pinewood Village Condominium Association (the Association). In compliance with the Order, the Association notified all customers and ceased use of the non-community public water supply system (PWS ID #4126002) at the site. The Association is in the process of applying for connection to the Town of Harwich municipal water.

An IRA Plan was submitted by KEY to DEP on October 9, 1997. The IRA received presumptive approval on October 29, 1997. The objective of the IRA was to address the Imminent Hazard condition posed by the detected concentrations of Trichloroethylene and Tetrachloroethylene; to further qualify and quantify the contaminants of concern revealed in the ground water at the site; to determine the source of the contamination revealed at the site, if possible; and to evaluate the site for conditions of Substantial Release Migration.

2.0 SITE DESCRIPTION

The Pinewood Village Condominiums is a 2.16 acre parcel of land which houses 16 detached single family cottages. The site is located north of the intersection of Route 28 and Depot Street in West Harwich. The West Harwich - Dennis town limit is located approximately 2,000 feet west of the site. (See Figure 1 - Site Location Plan).

The site is referenced by the Harwich Assessor's Office as Lots 1 through 16, Block F-1, on Sheet 10. The current owner-of-record are multiple individuals. The site was serviced by an on-site non-community public water supply well. This well is no longer in operation per DEP's Administrative Order. Each individual cottage is served by its own subsurface sewage disposal system. The site is serviced by overhead electric, natural gas, telephone and cable.

The general vicinity of the site is utilized for residential, non-secular and business uses. Properties abutting the site to the north and east are single-family residential dwellings. Properties adjacent to the site to the west include the Harwich Youth Center, town cemetery, and the West Harwich Baptist Church. The properties abutting the site to the south are businesses along Route 28. They include Orleans Auto Supply (#66 Route 28), a professional building (#72 Route 28), and a vacant residential dwelling which appears to be utilized for business-type purposes.

The professional building located at #72 Route 28 was built in 1987. It was reportedly a dry cleaner and laundromat during the 1960's and 1970's which was confirmed by municipal employees. According to Assessor's Records, the property located at 66 Route 28 (Orleans Auto Supply) was historically Brothers Automotive. It could not be determined through research whether automotive service and repairs were performed at this property. A former Gulf gasoline and service station is situated on the southeast corner of Route 28 and Belmont Avenue, approximately 240 feet southwest of the site. This gasoline station was in operation from approximately 1950 to 1987. See Figure 2 - Sampling Location/Site Vicinity Map for locations of these afore-mentioned properties that historically used, stored and generated oil and hazardous materials (OHMs).

3.0 RELEASE DESCRIPTION

In response to a Notice of Noncompliance (NON) issued by the DEP's Bureau of Resource Protection, Water Supply Program on June 23, 1997, water samples were collected at the site by DEP on August 18, 1997 and analyzed for volatile organic compounds (VOCs). Sampling of the potable water was repeated on August 28, 1997 at four (4) points in the water distribution network on the site. The locations included the center of the courtyard; after the wellhead; before the wellhead; and at a typical cottage. The following VOCs were detected in concentrations which exceed the applicable RCGW-1 category. The table is taken directly from the NOR issued by DEP.

TABLE 3.1 SUMMARY OF ANALYTICAL RESULT

08/18/97					
<u>ANALYTE</u>	<u>CONCENTRATION</u>				<u>RCGW-1</u>
p-Dichlorobenzene	11.0 ug/l				5.0 ug/l
Trichloroethylene	59.0				5.0
Vinyl chloride	3.8				2.0
cis-1,2 Dichloroethylene	86.0				70.0
Tetrachloroethylene	260.0				5.0

08/28/97					
<u>ANALYTE</u>	<u>COURTYARD</u>	<u>WELLHEAD AFTER</u>	<u>WELLHEAD BEFORE</u>	<u>UNIT #3</u>	<u>RCGW-1</u>
P-Dichlorobenzene	9.8	8.9	9.6	9.5	5.0 ug/l
Trichloroethylene	54.0	50.0	52.0	52.0	5.0
Vinyl chloride	3.6	3.4	3.4	3.2	2.0
cis-1,2 Dichloroethylene	80.0	76.0	79.0	78.0	70.0
Tetrachloroethylene	250.0	230.0	240.0	230.0	5.0

NOTE:

- All concentrations are reported in parts per billion (ug/l)

A review of the table reveals that Trichloroethylene (TCE) and Tetrachloroethylene (PCE) concentrations detected are ten (10) times the RCGW-1 standards. Therefore, this finding constituted an Imminent Hazard condition in accordance with 310 CMR 40.0320.

4.0 SUBSURFACE EXPLORATION

KEY completed a subsurface exploration on 11/13/97 in compliance with the approved IRA Plan. Weather conditions on the day of the drilling were sunny with temperatures averaging approximately 35° F. A Dig Safe Number (#974504883) was obtained prior to start of the subsurface exploration to determine the location of underground utilities.

4.1 Subsurface Exploration

KEY installed four ground water monitoring wells on the site utilizing hollow-stem auger techniques. See Figure 2 - Sampling Locations on the following page for locations of the wells. Ground water monitoring well 1 (MW-1) was installed at the northeast corner of the site. This monitoring well serves as one of the site's sampling points downgradient of other site monitoring wells and adjacent properties which used, stored and generated OHMs. The total depth of MW-1 is 50 feet with a 10 foot well screen set between 40 and 50 feet, at the upper surface of the impervious boundary (i.e. clay layer). This well was used to define the extent of the dense nonaqueous phase liquid (DNAPL) plume and to track its migration. It also assessed for a DNAPL pool on the impervious layer.

Ground water monitoring well 2 (MW-2) was installed at the southeast corner of the site. The total depth of MW-2 is 15 feet. The vertical placement of the screened interval was set across the ground water table to assess for light nonaqueous phase liquids (LNAPL) and dissolved hazardous substances in ground water.

Ground water monitoring well 3 (MW-3) was installed on the southwest corner of the site. The total depth of MW-3 is 15 feet. The vertical placement of the screened interval was set across the ground water table to assess for LNAPL and dissolved hazardous substances.

Ground water monitoring well 4 (MW-4) was installed at the northwest corner of the site, adjacent to Bells Neck Road. This well was placed with the proposed purpose of establishing background ground water quality conditions within the aquifer. Total depth of MW-4 is 15 feet. The vertical placement of the screened interval was set across the estimated ground water table to assess for LNAPL and dissolved hazardous substances.

During advancement of the bore holes, a split spoon sampler was driven utilizing the ASTM Standard Penetration Test, from one foot above the estimated ground water table to one foot below the estimated ground water table, and as needed. Ground water monitoring wells were constructed of schedule 40, flush threaded joint, 2" diameter, Poly Vinyl Chloride (PVC) pipe with a well screen slot size of 0.010". Well casings were installed flush with grade and covers were secured with hex bolts. Well screens were backfilled with washed silica sand, a bentonite pellet seal was placed above the screen, and well riser was backfilled with washed silica sand. See Appendix A - Subsurface Exploration Logs for details.

Subsurface conditions at the site, noted during the advancement of the four bore holes, revealed that the site is underlain by an unconfined aquifer to a depth of approximately 47 feet. Subsurface soils beneath the site consist of loose, outwash sand to approximately 47 feet. A dense, clay layer was encountered at 47 feet.

4.2 Media Sampling

KEY obtained soil samples while performing subsurface exploration on 11/13/97. KEY obtained ground water samples on 11/21/97 and measured ground water depths.

4.2.1 Ground Water Sampling

Ground water monitoring wells MW-1, MW-2, MW-3 were sampled. A dedicated pre-cleaned bailer was utilized to remove 3 - 5 standing volumes of water from each well during the sampling event. Bailed water was collected in a 55-gallon drum for the purpose of disposal characterization. The 55-gallon container was properly labeled while stored on site. New England Disposal Technologies, Inc., a licensed hazardous waste hauler, has been retained to remove and dispose of the drum from the site under a Hazardous Waste Manifest to a licensed hazardous waste disposal facility.

An appropriate volume of ground water was collected in pre-cleaned bottles and were preserved where required. Sample Chain-of-Custody procedures were observed.

4.2.2 Soil Sampling

The ground water table was encountered at approximately ten feet below grade. A split spoon sampler was advanced utilizing ASTM's Standard Penetration Test beginning at approximately one foot above the ground water table, and ending at approximately one foot below the ground water table. The appropriate volume of soil was placed in pre-cleaned bottles. Sample Chain-of-Custody and sample preservation methods were observed, if required.

All soil samples were considered for laboratory analysis. Olfactory and visual observations were not distinct with respect to evidence of contamination in the soil samples obtained from each bore hole. An Hnu-photoionizer was utilized to screen the soils obtained from the split spoon samples. Hnu photoionizer concentrations were consistently zero parts per million. Samples obtained from the bore holes advanced for the installation of MW-1, MW-2 and MW-3 were submitted to the laboratory for analysis.

4.3 Hydrogeology

4.3.1 Geological Setting

The site is located on the United States Geological Survey (USGS) Quadrangle - Harwich, Massachusetts, 1974. According to the topographical map, the site is situated at an elevation of approximately 10.0 feet above mean sea level. Topographic relief on the site is relatively undifferentiated.

Review of the DEP - BWSC Priority Resource Map for the Harwich, Massachusetts topographic quadrangle revealed that the site is located within a EPA-designated Sole Source Aquifer. In accordance with 310 CMR 40.0362, the site is located in an area mapped as a Ground Water Reporting Category 1 (RCGW-1). Likewise, in accordance with 310 CMR 40.0361, site soils are included in Soil Reporting Category RCS-1, because the soil samples obtained are from a GW-1 mapped area.

Subsurface exploration at the site revealed an unconfined aquifer underlying the site consisting of well sorted loose to medium dense sands. An impermeable clay layer was encountered at approximately 47 feet below grade. According to the *Geologic Map of the Harwich Quadrangle, Barnstable County, Cape Cod, Massachusetts*, dated 1969, the site is underlain with Harwich outwash plain deposits. Below this is a proglacial lake deposit (clay) which has a characteristically flat upper surface.

4.3.2 Hydrological Setting

Table 4.1 details instrument survey information and data obtained to establish ground water elevations. The elevations are based on N.G.V.D. The ground water monitoring wells were gauged on 11/21/97.

TABLE 4.1 GROUND WATER ELEVATION DATA

<u>WELL NUMBER</u>	<u>RISER ELEV.(FT)</u>	<u>WATER DEPTH (FT)</u>	<u>WATER ELEVATION (FT)</u>
MW-1	11.73	8.05	3.68
MW-2	15.31	11.50	3.81
MW-3	15.35	11.45	3.90
MW-4	18.19	Dry	--

The horizontal hydraulic gradient and the direction of ground water flow was mathematically calculated by solving a three-point geometric problem. Ground water flow direction is calculated to be towards the northeast. Horizontal hydraulic gradient was calculated to be 7.51×10^{-4} feet per foot. These hydrogeological parameters are graphically depicted in Figure 4 - Water Elevation Plan.

Ground water elevations are consistent with those established by the USGS study titled *Water Table Map of Brewster and Harwich, Massachusetts: September 21 to October 22, 1987*. See Figure 3, Water Table Map - Towns of Brewster and Harwich.

4.4 Laboratory Analysis

Ground water and soil samples obtained from ground water monitoring wells MW-1, MW-2 and MW-3 on 11/21/97, were submitted for laboratory analyses on 11/24/97. Ground water samples obtained from ground water monitoring wells MW-1, MW-2 and MW-3 were analyzed for Volatile Organic Compounds (VOCs) utilizing Method 8240A, Extractable Petroleum Hydrocarbons (EPH) utilizing Method 8015B (Prop), and dissolved lead and chromium. Soil samples were obtained from MW-1 boring at a depth of 10.0' to 12.0' and analyzed for VOCs, EPH by Method 8015B, lead and chromium. Soil samples were obtained from MW-1 boring at a depth of 50.0' to 52.0' and analyzed for VOCs. Soil samples were obtained from MW-2 boring at depth of 10.0' to 12.0' and analyzed for VOCs. Soil samples were obtained from MW-3 boring at depth of 10.0' to 12.0' and analyzed for EPH by Method 8015B, lead and chromium.

4.4.1 Ground Water Analytical Findings

The table on the following page summarizes laboratory analyses results from ground water samples obtained on 11/21/97. Commonwealth of Massachusetts Department of Environmental Protection (DEP) Reportable Concentrations (RC) for those sites mapped as geographically located within a Ground Water Category GW-1 are listed in a column to the right. See Appendix B - Laboratory Analysis Reports for details.

TABLE 4.2 - GROUND WATER ANALYTICAL RESULTS

<u>SAMPLE ID</u>	<u>ANALYTE</u>	<u>RESULT</u>	<u>RC / GW-1</u>
MW 1.1	VOCs		
	cis-1,2-Dichloroethene	5.0 ppb	70.0 ppb
	Methylene Chloride	7.0 ppb	5.0 ppb
	Tetrachloroethene	97.0 ppb	5.0 ppb
	Trichloroethene	5.0 ppb	5.0 ppb
MW 1.2	EPH (8015B)	0.86 ppm	0.2 ppm
MW 1.3	RCRA Metals		
	Lead	N.D.	0.5 ppm
	Chromium	N.D.	0.1 ppm

* See note
on Meth
Chloride

MW 2.1	VOCs		
	Methylene Chloride	6.0 ppb	5.0 ppb
MW 2.2	EPH (8015B)	0.42 ppm	0.2 ppm
MW 2.3	RCRA Metals		
	Lead	N.D.	0.5 ppm
	Chromium	N.D.	0.1 ppm
MW 3.1	VOCs		
	Methylene Chloride	7.0 ppb	5.0 ppb
MW 3.2	EPH (8015B)	N.D.	0.2 ppm
MW 3.3	RCRA Metals		
	Lead	N.D.	0.5 ppm
	Chromium	N.D.	0.1 ppm
GW 4.1 (Drum)	VOCs		
	Methylene Chloride	12.0 ppb	5.0 ppb
	Tetrachloroethene	21.0 ppm	5.0 ppm

Notes:

All results are in indicated units (parts per billion - ppb or parts per million - ppm)

RC / GW-1 = Reportable Concentration for Ground Water Category - 1

Tetrachloroethene (PCE) was detected in ground water samples obtained from GW-1 at a concentration of 97.0 ppb at a depth of 40.0' to 50.0', which is at the impervious boundary. This concentration exceeds the RC for a GW-1 category. Trichloroethene (TCE) and cis-1,2-Dichloroethene was detected in ground water samples obtained from GW-1 at its RC of 5.0 ppb. Methylene Chloride was detected in all ground water samples ranging from 6.0 ppb to 12.0 ppb. However, Methylene Chloride was revealed in all the laboratory method blanks analyzed for each sample. Therefore, Methylene Chloride is not considered a Contaminant of Concern in this investigation, but a laboratory artifact.

EPH was detected in ground water samples obtained from GW-1 and GW-2 at a concentration of 0.86 and 0.42 ppm, respectively. These concentrations exceed the RC for total petroleum hydrocarbons (TPH) which is 0.2 ppm.

4.4.2 Soil Analytical Findings

The following table summarizes laboratory analyses results from soil samples obtained during the advancement of the bore holes on the site. Commonwealth of Massachusetts Department of Environmental Protection (DEP) Reportable Concentrations (RC) for those sites mapped as geographically located within a Soil Category S-1 are listed in a column to the right. See Appendix B - Laboratory Analysis Reports - KEY, for details.

TABLE 4.2 - SOIL ANALYTICAL RESULTS

<u>SAMPLE ID</u>	<u>ANALYTE</u>	<u>RESULT</u>	<u>RC / S-1</u>
SS 1.1 (B-1)	RCRA Metals		
	Chromium	N.D.	1,000.0 ppm
	Lead	1.0	50.0 ppm
SS 1.2 (B-1))	EPH (8015B)	13.0 ppm	200 ppm
SS 1.3 (B-1)	VOCs		
	Methylene Chloride	19.0 ppb	100.0 ppb
SS 2.3 (B-1)	VOCs		
	Methylene Chloride	12.0 ppb	100.0 ppb
SS 3.1 (B-2)	VOCs		
	Methylene Chloride	13.0 ppb	100.0 ppb
SS 4.1 (B-3)	RCRA Metals		
	Chromium	ND	1,000.0 ppm
	Lead	1.0	50.0 ppm
SS 4.2 (B-3)	EPH (8015B)	N.D.	200.0 ppm

Analytical results revealed detectable levels of lead, EPH, and Methylene Chloride within the soil samples obtained at the site during the drilling activities. However, the concentrations detected are below respective RCs. The Methylene Chloride is considered a laboratory artifact.

5.0 PUBLIC & PRIVATE WATER SUPPLY SURVEYS

VOCs were revealed in the ground water at the site during the August 1997 sampling conducted by DEP - Division of Water Supply. Subsequently, the Towns of Harwich and Dennis conducted independent surveys of the private potable wells located in the vicinity of the Pinewood Village Condominiums. The following sections summary their findings.

5.1 Town of Harwich

The Town of Harwich Board of Health (BOH) provided KEY a survey of known private potable water wells within the vicinity of the site. The following table provides the property owner's last name, address, distance and direction of each well from the subject site:

Table 5.1 KNOWN PRIVATE WATER WELLS

<u>OWNER</u>	<u>ADDRESS</u>	<u>DISTANCE/DIRECTION</u>
Creighton	65 North Street	0.25 mi northeast
Graham (2 wells)	61 North Street	0.25 mi northeast
Sliney	53 North Road	0.25 mi northeast
Vacant Lot R-1	North Road	0.40 mi northeast
Owner?	95 North Road	0.40 mi northeast
Breingan	98 North Road	0.36 mi northeast
Irrigation Well	20 North Road	0.13 mi northeast
McKenny	44 Smith Street	0.17 mi northeast
Orleans Auto Supply	66 Route 28	0.0 mi south
Sweeney	29 North Road	0.17 mi east
Foster	28 North Road	0.13 mi east
Eldridge	93 North Road	0.32 mi east

The Harwich Water Department obtained samples of the ground water from the wells on each of the above-listed private properties in August 1997. The samples were delivered to the Barnstable County Health and Environmental Laboratory for VOC analysis utilizing EPA Method 524.2 and 502.2. The results of the analyses are provided in Appendix C - Country Laboratory Results - Town of Harwich. A table summary of the analytical results prepared by the Harwich BOH is also included in Appendix C. Concentrations of TCE and PCE at maximum of 420 and 5,300 ppb, respectively (Sliney & Creighton), were revealed in ground water samples obtained in private wells located 0.25 miles downgradient of the site in a northeasterly direction.

5.2 Town of Dennis

The Dennis Water Department provided the Dennis BOH with properties addresses between the Dennis/Harwich town limits and Depot Street (in Dennis) that were not connected to municipal water. The BOH subsequently obtained water samples from eight properties and delivered them to the Barnstable County Health and Environmental Laboratory for VOC analysis. The list of addresses has been requested of the Dennis BOH. KEY was able to obtain a copy of the analytical results from the Barnstable County Health and Environmental Laboratory. The following table provides the address of the property which has a private potable well, along with the distance and direction of each property from the subject site:

Table 5.2 KNOWN PRIVATE WATER WELLS

<u>ADDRESS</u>	<u>DISTANCE/DIRECTION</u>
116 Depot Street	0.75 feet west
277 Depot Street	0.75 feet west
9 Division Street	0.35 feet west
17 Division Street	0.35 feet west
6 Morris Road	0.85 feet southwest
21 Gilbert Street	0.45 feet west
105 Telegraph Street	0.45 feet west
175 Telegraph Street	0.45 feet west

Analytical results detected only one VOC (Chloroethane) in the ground water samples. All concentrations of Chloroethane detected were below its current RC for a GW-1 category.

6.0 SUBSTANTIAL RELEASE MIGRATION

The objective of the IRA was to address the Imminent Hazard condition posed by the detected concentrations of Trichloroethylene and Tetrachloroethylene; to further qualify and quantify the contaminants of concern revealed in the ground water at the site; to determine the source of the contamination revealed at the site, if possible; and to evaluate the site for conditions of Substantial Release Migration.

7.0 FINDINGS

On behalf of the Pinewood Village Condominium Association, KEY Environmental Services, Inc. (KEY) has completed an Immediate Response Action (IRA). The IRA was mandated by the Department of Environmental Protection (DEP) via the Notice of Responsibility (NOR) With Interim Deadlines, dated September 18, 1997 for the property referenced as the Pinewood Village Condominiums, located at 9 Bells Neck Road in West Harwich, Massachusetts, DEP Release Tracking No. 04-13326 (the site).

The NOR addressed a known release of volatile organic compounds (VOCs) at the site which exceeded the allowable Massachusetts Contaminant Levels for drinking water. Certain contaminant concentrations exceeded Reportable Concentrations (RC) for a Groundwater Category 1 (RCGW-1) established in the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000. Trichloroethylene (TCE) and Tetrachloroethylene (PCE) concentrations detected were ten (10) times the RCGW-1 standards. This finding constituted an Imminent Hazard Condition in accordance with 310 CMR 40.0320.

A "DO NOT USE ORDER" - Administrative Order was issued by the DEP to the Pinewood Village Condominium Association (the Association). In compliance with the Order, the Association notified all customers and ceased use of the non-community public water supply system at the site. The Association is in the process of applying for connection to the Town of Harwich municipal water.

An IRA Plan was submitted by KEY to DEP on October 9, 1997. The IRA received presumptive approval on October 29, 1997. KEY completed a subsurface investigation which involved the installation of four (4) ground water monitoring wells in accordance with the approved IRA Plan. The monitoring wells and their screened intervals were horizontally and vertically placed on the site to assess for the migration of contaminants onto the site from upgradient off - site properties which historically used, stored and generated oils and hazardous materials (OHMs) and to assess for evidence of the release originating on the site.

Advancement of the bore holes at the site revealed an unconfined aquifer to approximately 47 feet below grade, consisting of loose, glacial outwash sand. An impervious clay layer was encountered at approximately 47 feet. Ground water flow direction was calculated to be in a northeasterly direction with a horizontal hydraulic gradient is calculated to be 7.51×10^{-4} feet per foot.

Ground water and soil at the site were sampled and analyzed for VOCs utilizing Method 8240, Extractable Petroleum Hydrocarbons (EPH) utilizing Method 8015B, lead and chromium. The ground water analytical results revealed PCE, TCE, and cis-1,2 Dichloroethene at concentrations of 97.0, 5.0, 5.0 parts per billion (ppb), respectively, and EPH at a concentration of 0.86 parts per million (ppm). Analytical results of the soil samples obtained during advancement of the bore holes at the site revealed detectable levels of EPH, lead, and Methylene Chloride. However, the concentrations detected did not exceed their respective Reportable Concentrations for an S-1 category.

VOC contamination was revealed in the ground water at the site by the DEP Division of Water Supply during an August, 1997 sampling event. As a result of this finding, the Towns of Harwich and Dennis conducted independent surveys of the private potable wells located in the vicinity of the subject site. Their surveys involved the identification of the private potable water wells within the vicinity of the Pinewood Village Condominiums, along with sampling and laboratory analysis of

certain wells. Analytical results revealed levels of TCE and PCE at maximum concentrations of 420 and 5,300 ppb, respectively, in ground water wells located approximately 0.25 miles downgradient of the site and properties identified as formerly using, storing, and generating OHMs.

Based upon the information gathered during this IRA, it does not appear that a Condition of Substantial Release Migration exists at the subject site. The site has no known history of use, storage, or generation of OHMs. KEY's subsurface investigation did not reveal a dense nonaqueous phase liquid pool atop the impervious clay layer existing beneath the site. The analytical evidence collected during the IRA suggests that contaminants migrated onto the site from an upgradient source. These contaminants have tranversed the site and have continued to migrate onto downgradient sites.

8.0 REFERENCES

8.1 Commonwealth of Massachusetts Department of Environmental Protection

Bureau of Waste Site Cleanup - Priority Resources Map, Harwich Quadrangle

8.2 United State Geologic Survey

Topographical Map - Harwich, Massachusetts Quadrangle, dated 1974

Geologic Map of Harwich Quadrangle, Barnstable County, Cape Cod, Mass., 1969

Water Table Map of Brewster and Harwich, Massachusetts - 09/21/87 to 10/22/87.

8.3 Town of Harwich

Assessor's Office, Records and Maps Review

Board of Health, Records Review & Personal Interview - Paula Champagne, Agent

Town Clerk, Records Review

Building Department, Records Review

8.4 Town of Dennis

Assessor's Office, Personal Interview, Tanya Denault, Agent
Water Department, Personal Interview, Water Superintendent

8.5 Other Sources

Barnstable County, Cape Cod, Massachusetts Heath Dept. Laboratory
Environmental FirstSearch Report, dated 01/15/98

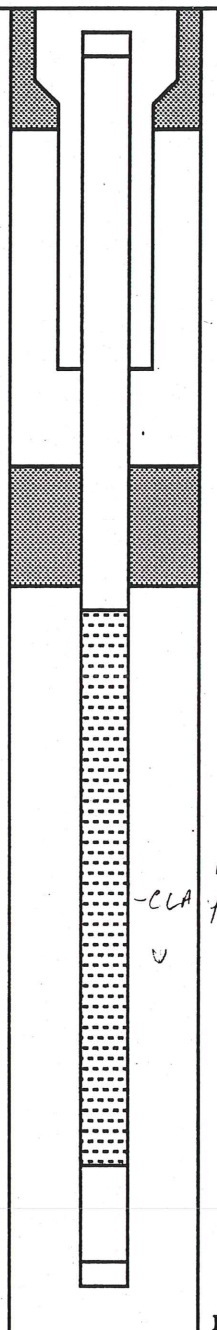
9.0 REPORT LIMITATIONS

This Environmental Assessment has been performed, findings obtained, and recommendations prepared in accordance with customary principles and practices in the fields of environmental science and engineering; and processes described by the Commonwealth of Massachusetts Department of Environmental Protection (DEP) in MGL ch. 21E, 310 CMR 40.00, and attending guidance documents. This statement is in lieu of all other statements either expressed or implied.

Environmental site assessments are inherently limited in the sense that conclusions are drawn and recommendations are developed from limited inquiry and the site reconnaissance. Additionally, the passage of time may result in a change in the environmental conditions at the site and surrounding properties. This report does not warrant against future operations or conditions, nor does this warrant operations or conditions present of a type or at a location not investigated. This report is not an environmental compliance audit.

EXPLORATION NAME: B-1 (50')DATE: 11/13/97EXPLORATION TYPE: BORING - AugerINSPECTOR: Nover6" outside diam.GRASS
-0.0

DEPTH	SPT	STRATA CHNG	SOIL CLASSIFICATION
0-7'			DK brown fine SAND
7-10			Med brown fine SAND
@ 10'			
10-12	2-4-4-6		Sample 1.1, 1.2, 1.3 taken
			light brown fine SAND w/ mottling
			15" recovery
20-22'	2-1-3-4		NO sample taken
			9" recovery
			light gray brown Med-fine SAND
			trace gravel
30-32'	2-3-3-10		NO recovery
40-42'	25-25		12" recovery
	25-25		light brown Med to fine SAND
@ 45'			CLAY
50-52	hammer wt (50-51)		sample taken 2.1, 2.2, 2.3
	22-22 last foot		gray clay
			Bottom well 50'



SURFACE ELEV: -0.0
 CASING TOP ELEV: _____
 CASING SECURITY: _____
 CASING DIAMETER: _____
 CASING LENGTH: _____
 RISER TOP ELEV: 0.5'
 RISER TOP PLUG: locking cap
 RISER DIAMETER: 2"
 RISER LENGTH: 10'
 RISER COUPLE: _____
 SCREEN SLOT SIZE: 0.020
 SCREEN DIAMETER: 2"
 SCREEN LENGTH: 10'
 SETTLING TUBE: _____
 SCREEN BOT PLUG: ✓
 SCREEN BOT ELEV: 50'
 WATER ELEV 1: _____
 GAUGING TIME 1: _____
 WATER ELEV 2: 8.05'
 GAUGING TIME 2: 11/21/97
 BOREHOLE DIA: 6"
 CASING GROUT: Cement
 RISER BACKFILL: SAND
 SCREEN GROUT: Bentonite
 SCREEN BACKFILL: Washed SAND
 BOREHOLE BOT ELEV: 50'

11/13/97Sunny 35°

SUBSURFACE EXPLORATION LOG

Pinewood Village Condominiums
 9 Bells Neck Road
 West Harwich, Massachusetts



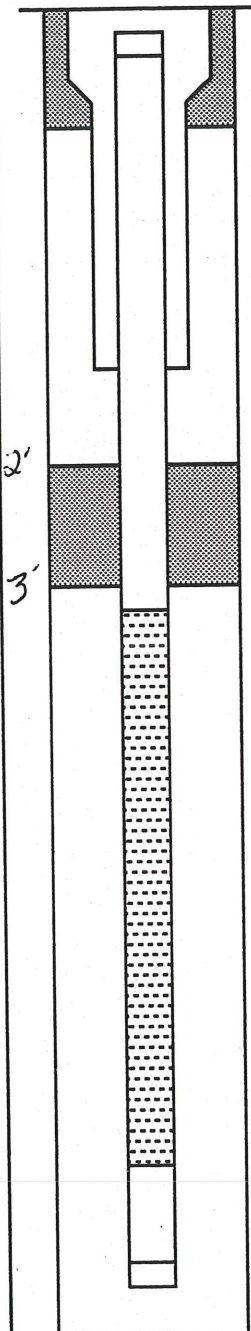
PROJECT: F436

FIGURE: Appendix C

SCALE: Not to scale

EXPLORATION NAME: B-2DATE: 11/13/97EXPLORATION TYPE: Auger Hollow Stem
American Drilling
ServicesINSPECTOR: NoverDrill Supr: KEN

DEPTH	SPT	STRATA CHNG	SOIL CLASSIFICATION
0-10'			Light-brown fine-med. sand
10-12'	3-55.7	▼ 10'	SAMPLE 3.1 taken 10" (200125) light brown sand w/ large Hottling
12-15'			very light brown sand - fine to med
			Bottom well 15.0'

SURFACE ELEV: GRASS - 0.0

CASING TOP ELEV: _____

CASING SECURITY: _____

CASING DIAMETER: _____

CASING LENGTH: _____

RISER TOP ELEV: 0.5'RISER TOP PLUG: locking CoupRISER DIAMETER: 2"RISER LENGTH: 5.0'

RISER COUPLE: _____

SCREEN SLOT SIZE: 0.020SCREEN DIAMETER: 2"SCREEN LENGTH: 10'SETTLING TUBE: ✓SCREEN BOT PLUG: ✓SCREEN BOT ELEV: 15.0'

WATER ELEV 1: _____

GAUGING TIME 1: _____

WATER ELEV 2: 11.50'GAUGING TIME 2: 11/21/97BOREHOLE DIA: 6" outside DIA.

CASING GROUT: _____

RISER BACKFILL: SANDSCREEN GROUT: DentriteSCREEN BACKFILL: WASHED SANDBOREHOLE BOT ELEV: 15.0'

SUBSURFACE EXPLORATION LOG

Pinewood Village Condominiums
9 Bells Neck Road
West Harwich, Massachusetts

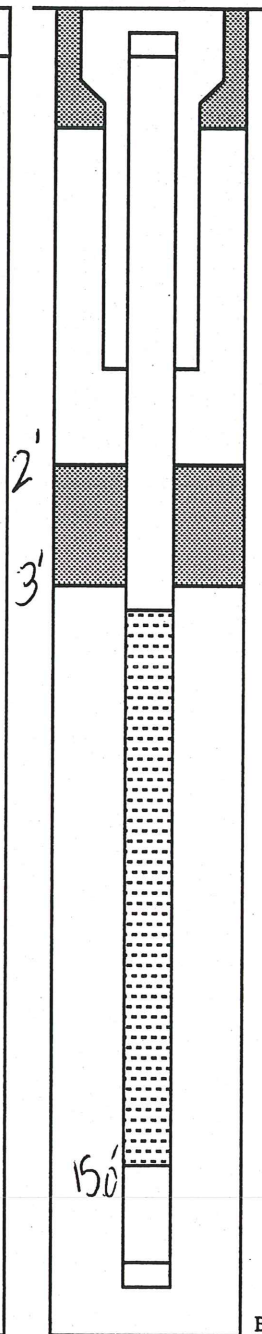
PROJECT: F436

FIGURE: Appendix C

SCALE: Not to scale

EXPLORATION NAME: B-3DATE: 11/13/97EXPLORATION TYPE: Hollow-Stem AugerINSPECTOR: Nover

DEPTH	SPT	STRATA CHNG	SOIL CLASSIFICATION
0-1			Loam
1-			
10-12	3-2-3-3	10' ▼	Sample taken 6" recovery 4.1 4.2 light brown-gray sandy med - moist
			Bottom 15.0'



SURFACE ELEV: 0.0' grass
 CASING TOP ELEV: _____
 CASING SECURITY: _____
 CASING DIAMETER: _____
 CASING LENGTH: _____
 RISER TOP ELEV: _____
 RISER TOP PLUG: locking cap
 RISER DIAMETER: _____
 RISER LENGTH: 5.0'
 RISER COUPLE: _____
 SCREEN SLOT SIZE: sch. 40
0.020
 SCREEN DIAMETER: 2"
 SCREEN LENGTH: 10.0'
 SETTLING TUBE: _____
 SCREEN BOT PLUG: ✓
 SCREEN BOT ELEV: 14.5'

WATER ELEV 1: _____
 GAUGING TIME 1: _____
 WATER ELEV 2: 11.45'
 GAUGING TIME 2: 11/21/97

BOREHOLE DIA: 6"
 CASING GROUT: _____
 RISER BACKFILL: sand
 SCREEN GROUT: benzene
 SCREEN BACKFILL: Washed Sand
 BOREHOLE BOT ELEV: 15.0'

SUBSURFACE EXPLORATION LOG

Pinewood Village Condominiums
 9 Bells Neck Road
 West Harwich, Massachusetts



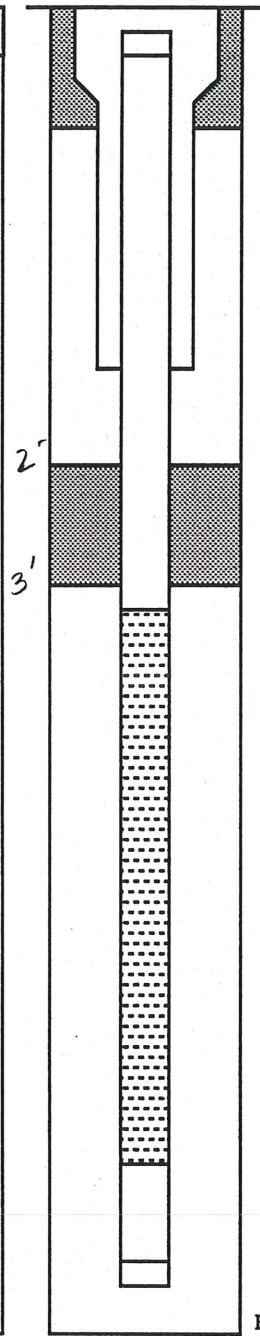
PROJECT: F436

FIGURE: Appendix C

SCALE: Not to scale

EXPLORATION NAME: B-4DATE: 11/13/97EXPLORATION TYPE: Hollow-Stem
AugerINSPECTOR: M. Nover

DEPTH	SPT	STRATA CHNG	SOIL CLASSIFICATION
0-5			grass/loam
5-60'			Med. brown SAND
6.0 - 10.0'	estimated ▼		light brown med sand with orange mottles
10 - 15.0'			light brown Med. sand with orange mottling

SURFACE ELEV: Loam

CASING TOP ELEV: _____

CASING SECURITY: _____

CASING DIAMETER: _____

CASING LENGTH: _____

RISER TOP ELEV: 0.5'RISER TOP PLUG: locking capRISER DIAMETER: 2"RISER LENGTH: 5'

RISER COUPLE: _____

SCREEN SLOT SIZE: 0.020SCREEN DIAMETER: 2"SCREEN LENGTH: 10'

SETTLING TUBE: _____

SCREEN BOT PLUG: ✓SCREEN BOT ELEV: 15.0'

WATER ELEV 1: _____

GAUGING TIME 1: _____

WATER ELEV 2: _____

GAUGING TIME 2: _____

BOREHOLE DIA: 6" outside diam.CASING GROUT: washed SANDRISER BACKFILL: BentoniteSCREEN GROUT: washed SANDSCREEN BACKFILL: washed SANDBOREHOLE BOT ELEV: 15.0'

SUBSURFACE EXPLORATION LOG

Pinewood Village Condominiums
9 Bells Neck Road
West Harwich, Massachusetts



PROJECT: F436

FIGURE: Appendix A

SCALE: Not to scale



Residential

Residential

Residential

Bells Neck Road

Mansion Street

Depot Street

Depot Street

MW-4 Existing Wellhead MW-1

THE SITE
(2.16± Acres)

Harwich
Youth
Center

Residential

MW-3

MW-2

Cemetery

West Harwich
Baptist
Church

Orleans
Auto
Supply
Former
Brothers
Automotive

#66

W. Harwich
Professional
Office Condo's

Former
Dry Cleaner &
Laundromat

#72

General
Business

Residential

Route 28

#55

Site of Former Gulf
Gasoline Station

**PROPOSED GROUND WATER MONITORING WELL
LOCATIONS**

**PINEWOOD VILLAGE CONDOMINIUMS
9 BELLS NECK ROAD
WEST HARWICH, MASSACHUSETTS**



PROJECT: F436

FIGURE: 1

SCALE: Not to scale



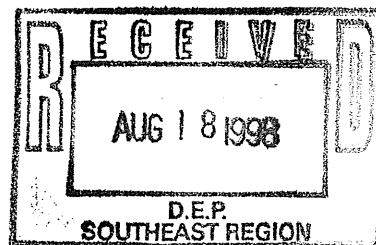
KEY Environmental Services, Inc.

379 LIBERTY STREET

ROCKLAND, MA 02370

TEL 781/871-8552

FAX 781/871-0612



**SUPPLEMENTAL
IMMEDIATE RESPONSE ACTION
COMPLETION REPORT**

**Pinewood Village Condominiums
9 Bells Neck Road
West Harwich, Massachusetts**

Release Tracking No. 04-13326

KEY File No. F436

Prepared For:

Pinewood Village Condominium Association
c/o Irving D. Weiner, President
23 Laurel Road
Sharon, MA 02067

August 18, 1998

i

1.0 INTRODUCTION

On behalf of the Pinewood Village Condominium Association, KEY Environmental Services, Inc. (KEY) has completed supplemental work associated with the Immediate Response Action (IRA) Completion Report which was submitted to the Department of Environmental Protection Bureau of Waste Site Cleanup (the Department) on January 21, 1998, for the property referenced as the Pinewood Village Condominiums, located at 9 Bells Neck Road in West Harwich, Massachusetts, DEP Release Tracking No. 04-13326 (the site).

During the initial IRA, KEY completed a subsurface investigation which involved the installation of four (4) ground water monitoring wells. The wells and their screened intervals were horizontally and vertically placed on the site to assess for the migration of contaminants onto the site from upgradient off - site properties which historically used, stored and generated oils and hazardous materials (OHMs), and to assess for evidence of the release originating on the site.

The supplemental work scope was verbally approved by the Department. The work scope involved the installation of two ground water monitoring wells; sampling and analysis of ground water; submission of information relative to any evidence of a release of oil and/or hazardous material to the environment; and a written description of the steps taken to provide an alternative potable water supply for all uses to all occupied condominiums units.

2.0 SITE DESCRIPTION

The site is described as a 2.16 acre parcel of land which houses 16 detached residential condominiums. The site is located north of the intersection of Route 28 and Depot Street in West Harwich, Massachusetts (the site). See Figure 1 - Site Location Plan.

3.0 SUPPLEMENTAL SUBSURFACE EXPLORATION

KEY completed the supplemental subsurface exploration on 07/22/98. Weather conditions on the day of the drilling were sunny with temperatures averaging approximately 85° F.

3.1 Subsurface Exploration

KEY installed two additional ground water monitoring wells on the site utilizing hollow-stem auger techniques. Ground water monitoring well 4B (MW-4B) was installed at the northwest corner of the site to replace a dry sampling point. This monitoring well serves as one of the site's upgradient sampling points. The total depth of MW-4B is 20.5 feet with a 10 foot well screen set between 10 and 20 feet. Ground water was encountered at approximately 14.5 feet below grade. See Figure 2 - Ground Water Monitoring Well Locations on the following page.

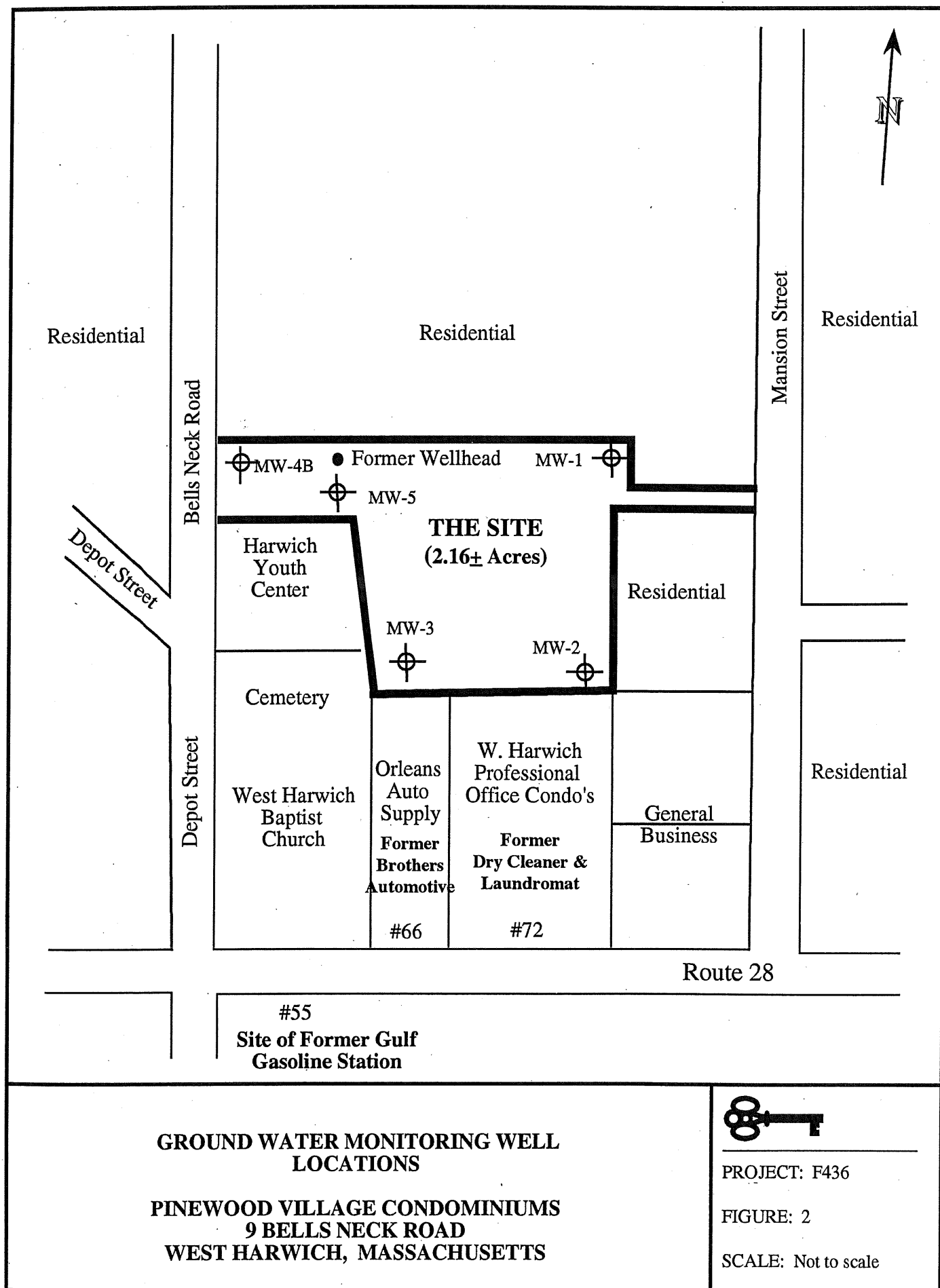
Ground water monitoring well 5 (MW-5) was installed within the north central portion of the site, south of the former public supply well head. The total depth of MW-5 is 30 feet. The vertical placement of the screened interval was set between 20 and 30 feet below grade to assess for volatile organic compounds (VOCs) with a specific gravity less than 1.0. Ground water was encountered at approximately 12.5 feet below grade.

During advancement of the bore holes, a split spoon sampler was driven utilizing the ASTM Standard Penetration Test at specified intervals. Ground water monitoring wells were constructed of schedule 40, flush threaded joint, 2" diameter, Poly Vinyl Chloride (PVC) pipe with a well screen slot size of 0.010." Well casings were installed flush with grade and covers were secured with hex bolts. Well screens were backfilled with washed silica sand, a bentonite pellet seal was placed above the screen, and the well riser was backfilled with washed silica sand. See Appendix A - Subsurface Exploration Logs for details.

Subsurface conditions at the site, noted during the advancement of the four bore holes advanced during the initial IRA field activities, revealed that the site is underlain by an unconfined aquifer to a depth of approximately 47 feet. Subsurface soils beneath the site consist of loose outwash sand to approximately 47 feet at which a dense clay layer was encountered. Subsurface soils observed during the advancement of the two additional boreholes were consistent with previous observations.

3.2 Ground Water Sampling

KEY obtained ground water samples on 07/28/98. The depth to ground water was measured at each ground water monitoring well on 08/14/98. Ground water monitoring wells MW-4B and



MW-5 were sampled. A dedicated pre-cleaned bailer was utilized to remove 3 - 5 standing volumes of water from each well during the sampling event. Bailed water was collected in a 55-gallon drum for the purpose of disposal characterization, if necessary. The 55-gallon container was properly labeled while stored on site.

An appropriate volume of ground water was collected in pre-cleaned bottles and were preserved where required. Sample Chain-of-Custody procedures were observed.

3.3 Hydrogeology

3.3.1 Geological Setting

The site is located on the United States Geological Survey (USGS) Quadrangle - Harwich, Massachusetts, 1974. According to the topographical map, the site is situated at an elevation of approximately 10.0 feet above mean sea level. Topographic relief on the site is relatively undifferentiated.

Review of the DEP - BWSC Priority Resource Map for the Harwich, Massachusetts topographic quadrangle revealed that the site is located within a EPA-designated Sole Source Aquifer. Accordingly, pursuant to 310 CMR 40.0362, the site is located in an area mapped as a Ground Water Reporting Category 1 (RCGW-1).

3.3.2 Hydrological Setting

Table 3.1 details instrument survey information and data obtained to establish ground water elevations. Land Planning, Inc., a professional land surveyor, performed the field survey. The elevations are based on N.G.V.D. The ground water monitoring wells were gauged on 08/14/98. The ground water flow direction was previously calculated to be from the southwest to the northeast. With the addition of two wells, the ground water flow direction was confirmed.

TABLE 3.1 GROUND WATER ELEVATION DATA

<u>WELL NUMBER</u>	<u>RISER ELEV.(FT)</u>	<u>WATER DEPTH (FT)</u>	<u>WATER ELEVATION (FT)</u>
MW-1	11.73	8.37	3.36
MW-2	15.31	11.75	3.56
MW-3	15.35	11.59	3.76
MW-4	18.19	14.18	4.01
MW-4B	18.24	14.39	3.85
MW-5	16.08	12.32	3.76

The horizontal hydraulic gradient and the direction of ground water flow was mathematically calculated by solving a three-point geometric problem. The ground water flow directions calculated during the initial work phase and the supplemental work phase are graphically depicted on the plan titled *Site Plan - Pinewood Village Condominiums in West Harwich, Mass.*, dated 05/19/78 which is included in Appendix C - Hydrogeological Calculations/Supporting Documentation.

3.4 Soil Field Screening

Soil samples were screened in the field for Volatile Organic Compounds (VOCs) utilizing HNu photoionizer detector (PID). The table on the following page summarizes soil field screening findings. Field screening utilizing a PID is not qualitative, but only quantitative, and does not produce the level of accuracy and repeatability of laboratory analyses. Concentrations are listed in parts per million (ppm).

<u>DEPTH</u>	<u>MW-4B</u>	<u>MW-5</u>
0.0' - 2.0'	ND	ND
5.0' - 7.0'	NS	NS
14.0' - 16.0'	200	180

Notes	NOS	Not Otherwise Specified
	ND	Not Detected at a concentration greater than method detection limit
	NS	No Sample obtained
	NL	No Laboratory analysis / no photoionizer field screening completed
	NA	Not Applicable

PID field screening of soil samples at the ground water interface revealed concentrations of VOCs ranging from 180 to 200 ppm. No odor was detected in any of the soil samples. Due to the levels detected within the saturated soil sample obtained from MW-4B, KEY installed MW-5 to further assess ground water conditions at the site.

3.5 Ground Water Analytical Findings

Ground water obtained from monitoring wells MW-4B and MW-5 were submitted for laboratory analyses on 07/29/98. Ground water samples obtained from wells MW-4B and MW-5 were analyzed for Volatile Organic Compounds (VOCs) utilizing EPA approved Method 8240.

The table on the following page summarizes laboratory analysis results from ground water samples obtained on 07/28/98. Commonwealth of Massachusetts Department of Environmental Protection (DEP) Reportable Concentrations (RC) for those sites mapped as geographically located within a Ground Water Category GW-1 are listed in a column to the right. See Appendix B - Laboratory Analysis Reports for details.

TABLE 3.2 - GROUND WATER ANALYTICAL RESULTS

<u>SAMPLE ID</u>	<u>ANALYTE</u>	<u>RESULT</u>	<u>RC / GW-1</u>
MW-4B	VOCs	ND	ND
MW-5	VOCs	ND	ND

Notes:

All results are in indicated units (parts per billion - ppb or parts per million - ppm)

RC / GW-1 = Reportable Concentration for Ground Water Category - 1

Analytical results revealed no detectable concentrations of VOCs within the ground water sampled from MW-4B and MW-5.

4.0 ALTERNATIVE WATER SUPPLY

The on-site public water supply well was recently decommissioned by Pinewood Village Condominium Association, site owner. The well has been permanently filled in with concrete. The Pinewood Village Condominium Association is currently in the process of providing municipal water to each of the 16 detached cottages on the site. The main water line has been installed at the site along with each individual water hook-up line.

5.0 POTENTIAL ON SITE SOURCES OF RELEASES

The site is currently being utilized for residential condominium purposes. The site has always been utilized for residential purposes. For the most part, the cottages are occupied during the summer months only. Uses of the site do not include the use, storage or generation of oil and/or hazardous materials.

KEY did not uncover evidence which would leave us to believe that the contamination revealed within the ground water at the site is the result of an on-site release. However, during the subsequent subsurface exploration, KEY inspected the entire site for evidence of any potential on-site sources of a release. KEY did not observe any evidence of underground storage tanks or oil and/or hazardous substance containers at the site. KEY did not observe any stressed vegetation or surficial soil staining at the site.

KEY screened surficial soils within the area where the dumpster was stored, just south of the former wellhead. KEY collected three surficial soil samples with a clean, stainless steel shovel. Using the jar-headspace analysis procedure, KEY screened each sample with the PID. No detectable concentrations of volatile organic vapors were revealed in the three samples.

There are numerous private subsurface septic systems servicing the 16 cottages on the site. Septic systems are a conduit for contaminants to enter the ground water. However, the contaminants revealed at the site, specifically Tetrachloroethene (PCE) is a chemical utilized in dry cleaning and textile operations, accounting for an estimated 60 percent of all PCE use in the U.S. In 1991. It is also used in the production of chlorofluorocarbons; in vapor degreasing and metal cleaning operations; in aerosol formulations; as a carrier for rubber coatings, solvent soaps, printing inks,

adhesives, sealants, polishes, lubricants, and silicones; and as a solvent in various consumer products, such as typewriter correction fluid and shoe polishes.

Trichloroethene and cis-1,2-Dichloroethene, which were also revealed within the ground water at the site, are known byproducts of PCE's natural attenuation process. PCE is not typically used for domestic purposes.

There is no history of use, storage, or generation of OHMs at the site. KEY's subsurface investigation did not reveal DNAPLs at the site. In addition, KEY's subsurface investigation did not reveal chlorinated solvents in the shallow aquifer (10 to 30 feet below grade) at the site. The analytical evidence gathered during the IRA and supplemental IRA suggests the source of the contamination is or was located on one or more upgradient properties, and through migration has, in KEY's opinion, come to be located within the ground water at the site.

6.0 FINDINGS & CONCLUSIONS

On behalf of the Pinewood Village Condominium Association, KEY Environmental Services, Inc. (KEY), has completed supplemental work associated with the Immediate Response Action (IRA) Completion Report submitted to the Department of Environmental Protection Bureau of Waste Site Cleanup (the Department) on January 21, 1998, for the property referenced as the Pinewood Village Condominiums, located at 9 Bells Neck Road in West Harwich, Massachusetts, DEP Release Tracking No. 04-13326 (the site).

During the initial IRA, KEY completed a subsurface investigation which involved the installation of four (4) ground water monitoring wells at the site. The wells and their screened intervals were horizontally and vertically placed on the site to assess for the migration of contaminants onto the site from upgradient, off - site properties which historically uses stored and generated oils and hazardous materials (OHMs), and to assess for evidence of the release originating at the site.

The supplemental work scope involved the installation of two additional ground water monitoring wells (MW-4B & MW-5); sampling and analysis of ground water; submission of information relative to any evidence of a release of oil and/or hazardous material to the environment; and a

written description of the steps taken to provide an alternative potable water supply for all uses to all occupied condominium units.

Ground water obtained from ground water monitoring wells MW-4B and MW-5 were analyzed for Volatile Organic Compounds (VOCs) utilizing EPA approved Method 8240. Analytical results revealed no detectable levels of VOCs within the ground water sampled.

The on-site public water supply well was recently decommissioned by Pinewood Village Condominium Association, site owner. The Pinewood Village Condominium Association is currently in the process of providing municipal water to each of the 16 detached cottages on the site. The main water line has been installed along with each individual water line hook-up.

KEY did not uncover evidence which would leave us to believe that the contamination revealed within the ground water at the site is the result of an on-site release. However, during subsequent subsurface exploration, KEY inspected the entire site for evidence of any potential on-site sources of a release. KEY did not observe any evidence of underground storage tanks or oil and/or hazardous substance containers at the site. KEY did not observe any stressed vegetation or surficial soil staining at the site.

KEY screened surficial soils within the area where the dumpster was stored, just south of the former wellhead. KEY collected three surficial soil samples with a clean, stainless steel shovel. Using the jar-headspace analysis procedure, KEY screened each sample with an Hnu-photoionizer detector. No detectable concentration of volatile organic vapors were revealed in the three samples.

The contaminants revealed at the site, specifically Tetrachloroethene (PCE), is a chemical utilized in dry cleaning and textile operations, accounting for an estimated 60 percent of all PCE use in the U.S. in 1991. It is also used in the production of chlorofluorocarbons; in vapor degreasing and metal cleaning operations; in aerosol formulations; as a carrier for rubber coatings, solvent soaps, printing inks, adhesives, sealants, polishes, lubricants, and silicones; and as a solvent in various consumer products, such as typewriter correction fluid and shoe polishes. Trichloroethene and cis-1,2-Dichloroethene, which were also revealed within the ground water at the site, are known byproducts of the natural attenuation of PCE. PCE is not typically used for domestic purposes.

There is no known history of use, storage, or generation of OHMs at the site. KEY's subsurface investigation did not reveal dense nonaqueous phase liquids (DNAPLs) at the site. In addition, chlorinated solvents were not revealed in the shallow aquifer (10 to 30 feet below grade) at the site. The analytical evidence gathered during the IRA and supplemental IRA suggests the source of the contamination is or was located on one or more upgradient properties; and through migration has, in KEY's opinion, come to be located within the ground water at the site.

7.0 REFERENCES

7.1 Commonwealth of Massachusetts Department of Environmental Protection

Bureau of Waste Site Cleanup - Priority Resources Map, Harwich Quadrangle

7.2 United State Geologic Survey

Topographical Map - Harwich, Massachusetts Quadrangle, dated 1974

Geologic Map of Harwich Quadrangle, Barnstable County, Cape Cod, Mass., 1969

Water Table Map of Brewster and Harwich, Massachusetts - 09/21/87 to 10/22/87.

7.3 Other Sources

Environmental FirstSearch Report, dated 01/15/98

U.S. EPA Office of Ground Water and Drinking Water - Technical Factsheets

8.0 REPORT LIMITATIONS

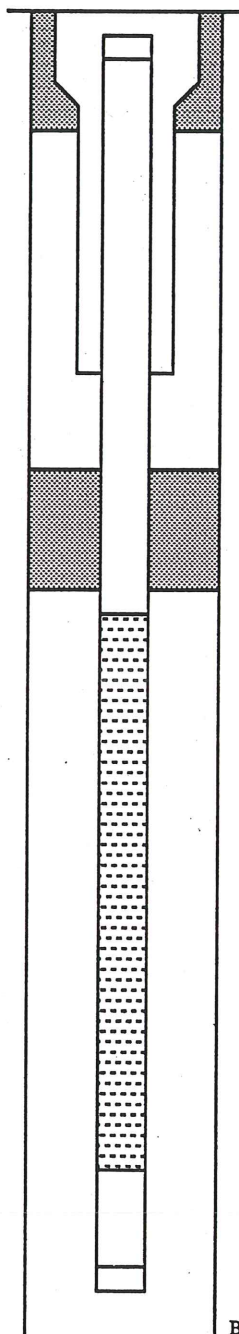
This Environmental Assessment has been performed, findings obtained, and recommendations prepared in accordance with customary principles and practices in the fields of environmental science and engineering; and processes described by the Commonwealth of Massachusetts Department of Environmental Protection (DEP) in MGL ch. 21E, 310 CMR 40.00, and attending guidance documents. This statement is in lieu of all other statements either expressed or implied.

Environmental site assessments are inherently limited in the sense that conclusions are drawn and recommendations are developed from limited inquiry and the site reconnaissance. Additionally, the passage of time may result in a change in the environmental conditions at the site and surrounding properties. This report does not warrant against future operations or conditions, nor does this warrant operations or conditions present of a type or at a location not investigated. This report is not an environmental compliance audit.

EXPLORATION NAME: MW-4B
groundwater
 EXPLORATION TYPE: monitoring well

DATE: 7/22/98
 INSPECTOR: Nover/Morin

DEPTH	SPT	STRATA CHNG	SOIL CLASSIFICATION
0-2'			grass
1-2'			dk brown, loose med + fine sands
2-5'			orange/ loose, dry, tan med + fine sands ↓
5-10'			
14-16'	5-6 8-10		H ₂ O @ ≈ 14.5' wet, loose orange/tan and beige med. and fine sands
16-20'			no odor H ₂ O ≈ 200 ppm sample sent to lab ↓ well set at 20' *Steam cleared augers.



SURFACE ELEV: grade
 CASING TOP ELEV: grade
 CASING SECURITY: hex bolts
 CASING DIAMETER: 7"
 CASING LENGTH: 10"
 RISER TOP ELEV: 0.5'
 RISER TOP PLUG: exp. plug
 RISER DIAMETER: 2"
 RISER LENGTH: 10'
 RISER COUPLE: threaded

SCREEN SLOT SIZE: 0.010"
 SCREEN DIAMETER: 2"
 SCREEN LENGTH: 10'
 SETTLING TUBE: none
 SCREEN BOT PLUG: well point
 SCREEN BOT ELEV: 20.0

WATER DEPTH 1: _____
 GAUGING DATE 1: _____
 WATER DEPTH 2: _____
 GAUGING DATE 2: _____

BOREHOLE DIA: 8.5"
 CASING GROUT: cement
 RISER BACKFILL: common
 SCREEN GROUT: bentonite
 SCREEN BACKFILL: washed sands
 BOREHOLE BOT ELEV: 20' 6"

SUBSURFACE EXPLORATION LOG

9 BELLS NECK ROAD
 HARWICH, MASSACHUSETTS



PROJECT: F436

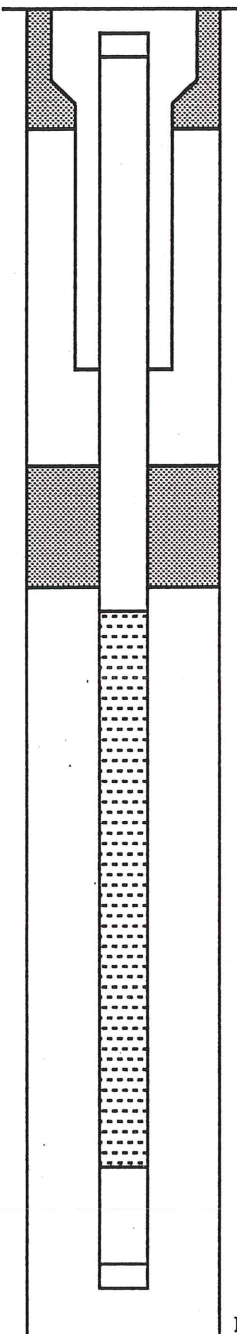
FIGURE: Appendix B

SCALE: Not to scale

EXPLORATION NAME: MW-5
EXPLORATION TYPE: Groundwater Monitoring Well

DATE: 7/22/98
INSPECTOR: Nover / Morin

DEPTH	SPT	STRATA CHNG	SOIL CLASSIFICATION
0-2'			Grass
1'-5'			Loose, beige, med. and fine sands. Dry
5'-10'			↓
13'-15'	4-5 6-9		H ₂ O @ ≈ 12.5' wet, loose, yellow beige medium sands. Some fine sands. Trace of coarse sands no odor H ₂ Nu = 180 ppm sampled for lab
15'-30'			Well set @ 30'



SURFACE ELEV: grade
CASING TOP ELEV: grade
CASING SECURITY: hex bolts
CASING DIAMETER: 7"
CASING LENGTH: 10"

RISER TOP ELEV: 0.5'
RISER TOP PLUG: exp. plug
RISER DIAMETER: 2"
RISER LENGTH: 20'
RISER COUPLE: threaded

SCREEN SLOT SIZE: 0.010"
SCREEN DIAMETER: 2"
SCREEN LENGTH: 10'
SETTLING TUBE: none
SCREEN BOT PLUG: 6" well point
SCREEN BOT ELEV: 30'

WATER DEPTH 1: _____
GAUGING DATE 1: _____
WATER DEPTH 2: _____
GAUGING DATE 2: _____

BOREHOLE DIA: 8.5"
CASING GROUT: cement
RISER BACKFILL: common
SCREEN GROUT: bentonite
SCREEN BACKFILL: washed sands
BOREHOLE BOT ELEV: 30.5'

SUBSURFACE EXPLORATION LOG

9 BELLS NECK ROAD
HARWICH, MASSACHUSETTS



PROJECT: F436

FIGURE: Appendix B

SCALE: Not to scale

GeoLabs, Inc.
Environmental Laboratories

PREPARED FOR:

Key Environmental Services, Inc.
379 Liberty Street
Rockland, MA 02370

Attn: Marta Nover/Deb Morin

PROJECT ID:

F-436
Harwich

GEOLABS CLIENT #:

1150-94

SAMPLE NUMBER:

69860-69861


DATE PREPARED:

July 30, 1998

PREPARED BY:

Christine Johnson

APPROVED BY:


Jim Chen, Laboratory Director/Date

7-30-98

GeoLabs, Inc.
Environmental Laboratories

CLIENT NAME:	KEY ENVIRONMENTAL	PROJECT ID:	F-436
SAMPLE TYPE:	GROUND WATER	REPORT DATE:	07/30/98
COLLECTION DATE:	07/28/98	ANALYZED BY:	ZYZ 07/29/98
REC'D BY LAB:	07/29/98	EXTRACTION DATE:	N/A
COLLECTED BY:	CLIENT	DIGESTION DATE:	N/A

VOLATILE ORGANICS

SAMPLE NUMBER:	69860	69861
SAMPLE LOCATION:	MW-4B	MW-5

	RESULTS (µg/L)		DETECTION LIMIT (µg/L)
Acetone	ND	ND	50.0
Acrolein	ND	ND	50.0
Acrylonitrile	ND	ND	50.0
Benzene	ND	ND	5.0
Bromoform	ND	ND	5.0
Bromomethane	ND	ND	1.5
2-Butanone (MEK)	ND	ND	10.0
Carbon Disulfide	ND	ND	5.0
Carbon Tetrachloride	ND	ND	5.0
Chlorobenzene	ND	ND	5.0
Chloroethane	ND	ND	5.0
2-Chloroethylvinylether	ND	ND	5.0
Chloroform	ND	ND	5.0
Chloromethane	ND	ND	5.0
Dibromochloromethane	ND	ND	5.0
1,2-Dichlorobenzene	ND	ND	5.0
1,3-Dichlorobenzene	ND	ND	5.0
1,4-Dichlorobenzene	ND	ND	5.0
Bromodichloromethane	ND	ND	5.0
1,1-Dichloroethane	ND	ND	5.0
1,2-Dichloroethane	ND	ND	5.0
1,1-Dichloroethene	ND	ND	0.75
c-1,2-Dichloroethene	ND	ND	5.0
t-1,2-Dichloroethene	ND	ND	5.0

GeoLabs, Inc.
Environmental Laboratories

CLIENT NAME:	KEY ENVIRONMENTAL	PROJECT ID:	F-436
SAMPLE TYPE:	GROUND WATER	REPORT DATE:	07/30/98
COLLECTION DATE:	07/28/98	ANALYZED BY:	ZYZ 07/29/98
REC'D BY LAB:	07/29/98	EXTRACTION DATE:	N/A
COLLECTED BY:	CLIENT	DIGESTION DATE:	N/A

VOLATILE ORGANICS

SAMPLE NUMBER:	69860	69861
SAMPLE LOCATION:	MW-4B	MW-5

	RESULTS (µg/L)		DETECTION LIMIT (µg/L)
1,2-Dichloropropane	ND	ND	5.0
c-1,3-Dichloropropene	ND	ND	5.0
t-1,3-Dichloropropene	ND	ND	5.0
Ethylbenzene	ND	ND	5.0
2-Hexanone	ND	ND	5.0
4-Methyl-2-pentanone (MIBK)	ND	ND	5.0
Methylene Chloride	ND	ND	10.0
Methyl tert-butyl ether	ND	ND	5.0
Styrene	ND	ND	5.0
1,1,2,2-Tetrachloroethane	ND	ND	1.7
Tetrachloroethene	ND	ND	5.0
Toluene	ND	ND	5.0
1,1,1-Trichloroethane	ND	ND	5.0
1,1,2-Trichloroethane	ND	ND	5.0
Trichloroethene	ND	ND	5.0
Trichlorofluoromethane	ND	ND	5.0
Vinyl Chloride	ND	ND	2.0
Xylenes	ND	ND	5.0

ND = NOT DETECTED

Method Reference:

EPA Method 8240 (1) GC/MS

1) U.S. EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 1986, 3rd Edition.

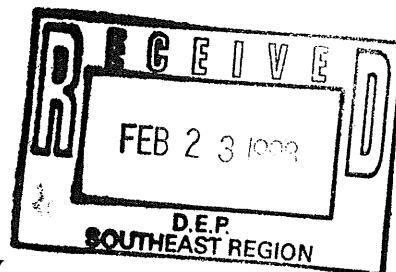
**GEOLABS, INC.
10 PLAIN STREET
BRAINTREE, MA 02184**

LIMITATIONS & EXCLUSIONS

All the professional opinions presented in this report are based solely on the scope of work conducted and sources referred to in our report. The data presented by GeoLabs in this report was collected and analyzed using generally accepted industry methods and practices at the time the report was generated. This report represents the conditions, locations and materials that were observed at the time the work was conducted. No inferences regarding other conditions, locations or materials, at a later or earlier time may be made based on the contents of the report. No other warranty, express or implied is made.

This report was prepared for the sole use of our client. Portions of the report may not be used independent of the entire report.

All analyses were performed within required holding times, in accordance with EPA protocols and using accepted QA/QC procedures. The information contained in this report is, to the best of my knowledge, accurate and complete.



**DOWNGRADIENT PROPERTY
STATUS OPINION**

**Pinewood Village Condominiums
9 Bells Neck Road
Harwich, Massachusetts**

**DEP RTN 4-13326
KEY File F436**

Prepared For :

Pinewood Village Condominium Association
c/o Irving D. Weiner, President
23 Laurel Road
Sharon, MA 02067

February 16, 1998

2/16/98

DGPS

EXECUTIVE SUMMARY

In January and February 1998, KEY Environmental Services, Inc. (KEY) completed a Downgradient Property Status (DPS) Opinion for property referenced as the Pinewood Village Condominiums located at 9 Bells Neck Road; in Harwich, Massachusetts (the DPS site). The project was performed in accordance with customary principles and practices in the fields of environmental science and engineering; and processes prescribed by the Commonwealth of Massachusetts Department of Environmental Protection (DEP) in Massachusetts General Laws ch 21E, 310 Code of Massachusetts of Regulations 40.0183.

In November and December 1997 and January 1998, KEY Environmental Services, Inc. (KEY) completed an Immediate Response Action (IRA). The IRA was mandated by the Department of Environmental Protection (DEP) via the Notice of Responsibility (NOR) With Interim Deadlines, dated September 18, 1997 for the Pinewood Village Condominiums, located at 9 Bells Neck Road in Harwich, Massachusetts, DEP Release Tracking No. 04-13326 (the site).

The NOR addressed a known release of volatile organic compounds (VOCs) at the site which exceeded the allowable Massachusetts Contaminant Levels for drinking water. Certain contaminant concentrations detected exceeded their current Reportable Concentrations (RC) for a Groundwater Category 1 (RCGW-1) established in the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000. Trichloroethylene (TCE) and Tetrachloroethylene (PCE) concentrations detected were ten (10) times the RCGW-1 standards. This finding constituted an Imminent Hazard Condition in accordance with 310 CMR 40.0320.

A "DO NOT USE ORDER" - Administrative Order was issued by the DEP to the Pinewood Village Condominium Association (the Association). In compliance with the Order, the Association notified all customers and ceased use of the non-community public water supply system at the site. The Association is in the process of connecting to the Town of Harwich municipal water system. The IRA Plan was submitted to DEP on October 9, 1997. The plan received presumptive approval on October 29, 1997.

The NOR issued for the DPS site identified an Imminent Hazard Condition in accordance with 310 CMR 40.0320 and mandated the completion of an IRA. An IRA has been conducted in accordance with a DEP-approved IRA Plan. The IRA Completion Report was submitted to DEP on January

18, 1998. In addition to the assessment only IRA, the on-site Public Water Supply Well has been shut down. Based upon the findings of the IRA, it is our opinion that there is no need to conduct additional IRAs at the DPS site.

The DPS site is a 2.16 acre contiguous parcel of land which contains 16 detached single family cottages. The DPS site has been utilized for residential purposes since its original site improvements to the property. Current and historical site use does not include the use, store or generate oil and hazardous materials (OHMs).

KEY completed a subsurface investigation which involved the installation of four (4) ground water monitoring wells in accordance with the approved IRA Plan. The monitoring wells and their screened intervals were horizontally and vertically placed on the site to assess for the migration of contaminants onto the site from off - site properties which historically used, stored and generated OHMs and to assess for evidence of the release originating on the site.

Subsurface exploration revealed an unconfined aquifer underlying the site consisting of well-sorted loose to medium dense sands. An impermeable clay layer was encountered at approximately 47 feet below grade. Ground water flow direction was calculated to be from southwest to northeast. The horizontal hydraulic gradient is 7.51×10^{-4} feet per foot.

Ground water and soil at the site were sampled and analyzed for VOCs utilizing Method 8240, Total Petroleum Hydrocarbons (TPH) utilizing Method 8015B, lead, and chromium. The ground water analytical results revealed tetrachloroethene, trichloroethene, and cis-1,2 Dichloroethene at concentrations of 97.0, 5.0, 5.0 parts per billion, respectively, and TPH at a concentration of 0.86 parts per million. The soils obtained during advancement of the bore holes at the DPS site revealed detectable levels of TPH, lead, and Methylene Chloride. The concentrations detected did not exceed their respective Reportable Concentrations for an S-1 category.

KEY's subsurface investigation did not reveal a dense nonaqueous phase liquid (DNAPL) pool of contaminants atop the impervious clay layer existing beneath the site. The analytical evidence collected during the IRA suggested that contaminants have migrated onto the site from an upgradient source, or sources. These contaminants have traversed the site and have continued to migrate onto other downgradient properties.

Three properties within 250 feet and upgradient of the DPS site historically used, stored, and generated OHMs and are considered potential sources of ground water contamination on the DPS site. A clothes dry cleaning operation operated on the abutting property (#72 Route 28) during the 1960s and 1970s. The property located at #66 Route 28 was historically occupied by Brothers Automotive. This property abuts the DPS site to the south. A Gulf gasoline and service station operated the property referenced as #55 Route 28, located approximately 240 feet southwest of the DPS site, from approximately 1950 to 1987.

The findings of the Assessment Only - Immediate Response Action performed at the site by KEY uncovered that the source of the release revealed at the DPS site was located on one or more upgradient properties identified in this submittal. Contaminants from that source, or sources, have come to be located at the DPS site as a result of migration of the material in the ground water.

With the findings of the IRA as supporting documentation, KEY is submitting a Downgradient Property Status Opinion for the DPS site. It has been prepared in accordance with the processes prescribed by the Commonwealth of Massachusetts Department of Environmental Protection (DEP) in Massachusetts General Laws ch. 21E, 310 Code of Massachusetts Regulation 40.0183.

**DOWNGRADIENT PROPERTY
STATUS OPINION**

**Pinewood Village Condominiums
9 Bells Neck Road
Harwich, Massachusetts
DEP RTN 4-13326
KEY File No. F436**

1.0 INTRODUCTION

In November and December 1997 and January 1998, KEY Environmental Services, Inc. (KEY) completed an Immediate Response Action (IRA). The IRA was mandated by the Department of Environmental Protection (DEP) via the Notice of Responsibility (NOR) With Interim Deadlines, dated September 18, 1997 for the Pinewood Village Condominiums, located at 9 Bells Neck Road in Harwich, Massachusetts, DEP Release Tracking No. 4-13326 (the DPS site).

The NOR addressed a known release of volatile organic compounds (VOCs) at the DPS site which exceeded the allowable Massachusetts Contaminant Levels for drinking water. Certain contaminant concentrations detected exceeded their current Reportable Concentrations (RC) for a Groundwater Category 1 (RCGW-1) established in the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000. Trichloroethylene (TCE) and Tetrachloroethylene (PCE) concentrations detected were ten (10) times the RCGW-1 standards. This finding constituted an Imminent Hazard Condition in accordance with 310 CMR 40.0320.

A "DO NOT USE ORDER" - Administrative Order was issued by the DEP to the Pinewood Village Condominium Association (the Association). In compliance with the Order, the Association notified all customers and ceased use of the non-community public water supply system at the DPS site. The Association is in the process of connecting to the Town of Harwich municipal water system.

An IRA Plan was submitted to DEP on October 9, 1997. The plan received presumptive approval on October 29, 1997. Subsequently, KEY completed a subsurface investigation which involved the installation of four (4) ground water monitoring wells in accordance with the IRA Plan. The monitoring wells and their screened intervals were horizontally and vertically placed on the site to assess for the migration of contaminants onto the site from off - site properties which historically used, stored and generated oils and hazardous materials (OHMs) and to assess for evidence of the release originating on the site.

Advancement of the bore holes at the DPS site revealed an unconfined aquifer to approximately 47 feet below grade, consisting of loose, glacial outwash sand. An impervious clay layer was encountered at approximately 47 feet. Ground water flow direction was calculated to be in a northeasterly direction with a horizontal hydraulic gradient is calculated to be 7.51×10^{-4} feet per foot.

Ground water and soil at the site were sampled and analyzed for VOCs utilizing Method 8240, Extractable Petroleum Hydrocarbons (TPH) utilizing Method 8015B, lead and chromium. The ground water analytical results revealed PCE, TCE, and cis-1,2 Dichloroethene at concentrations of 97.0, 5.0, 5.0 parts per billion (ppb), respectively, and TPH at a concentration of 0.86 parts per million (ppm). Analytical results of the soil samples obtained during advancement of the bore holes at the site revealed detectable levels of TPH, lead, and Methylene Chloride. The following tables summarize the analytical results from the ground water samples taken at the DPS site during the IRA conducted by KEY. Commonwealth of Massachusetts Department of Environmental Protection (DEP) Reportable Concentrations (RC) for those sites mapped as geographically located within a Ground Water Category GW-1 are listed in a column to the right.

TABLE 1.1 - GROUND WATER ANALYTICAL RESULTS

<u>SAMPLE ID</u>	<u>ANALYTE</u>	<u>RESULT</u>	<u>RC / GW-1</u>
MW 1.1	VOCs		
	cis-1,2-Dichloroethene	5.0 ppb	70.0 ppb
	Methylene Chloride	7.0 ppb	5.0 ppb
	Tetrachloroethene	97.0 ppb	5.0 ppb
	Trichloroethene	5.0 ppb	5.0 ppb

MW 1.2	TPH (8015B)	0.86 ppm	0.2 ppm
MW 1.3	RCRA Metals		
	Lead	N.D.	0.5 ppm
	Chromium	N.D.	0.1 ppm
MW 2.1	VOCs		
	Methylene Chloride	6.0 ppb	5.0 ppb
MW 2.2	TPH (8015B)	0.42 ppm	0.2 ppm
MW 2.3	RCRA Metals		
	Lead	N.D.	0.5 ppm
	Chromium	N.D.	0.1 ppm
MW 3.1	VOCs		
	Methylene Chloride	7.0 ppb	5.0 ppb
MW 3.2	TPH (8015B)	N.D.	0.2 ppm
MW 3.3	RCRA Metals		
	Lead	N.D.	0.5 ppm
	Chromium	N.D.	0.1 ppm
GW 4.1 (Drum)	VOCs		
	Methylene Chloride	12.0 ppb	5.0 ppb
	Tetrachloroethene	21.0 ppb	5.0 ppb

Notes:

All results are in indicated units (parts per billion - ppb or parts per million - ppm)
RC / GW-1 = Reportable Concentration for Ground Water Category - 1

The PCE, TCE and cis-1,2 Dichloroethene detected in the ground water was obtained from MW-1 at a depth of 40.0' to 50.0', at the impervious clay boundary. TPH was detected in ground water samples obtained from MW-1 and MW-2 at a concentration of 0.86 and 0.42 ppm, respectively.

The following tables summarize the analytical results from the soil samples taken at the DPS site during the IRA conducted by KEY. Commonwealth of Massachusetts Department of Environmental Protection (DEP) Reportable Concentrations (RC) for those sites mapped as geographically located within a Ground Water Category S-1 are listed in a column to the right.

TABLE 1.2 - SOIL ANALYTICAL RESULTS

<u>SAMPLE ID</u>	<u>ANALYTE</u>	<u>RESULT</u>	<u>RC / S-1</u>
SS 1.1 (B-1)	RCRA Metals		
	Chromium	N.D.	1,000.0 ppm
	Lead	1.0	50.0 ppm
SS 1.2 (B-1))	TPH (8015B)	13.0 ppm	200 ppm
SS 1.3 (B-1)	VOCs		
	Methylene Chloride	19.0 ppb	100.0 ppb
SS 2.3 (B-1)	VOCs		
	Methylene Chloride	12.0 ppb	100.0 ppb
SS 3.1 (B-2)	VOCs		
	Methylene Chloride	13.0 ppb	100.0 ppb
SS 4.1 (B-3)	RCRA Metals		
	Chromium	ND	1,000.0 ppm
	Lead	1.0	50.0 ppm
SS 4.2 (B-3)	TPH (8015B)	N.D.	200.0 ppm

Analytical results revealed detectable levels of lead, TPH, and Methylene Chloride within the soil samples obtained at the site during the drilling activities. However, the concentrations detected are below respective RCs. The Methylene Chloride is considered a laboratory artifact.

Based upon the information gathered during this IRA, it does not appear that a Condition of Substantial Release Migration exists at the DPS site. The site has no known history of use, storage, or generation of OHMs. KEY's subsurface investigation did not reveal a dense nonaqueous phase liquid (DNAPL) pool of contaminants atop the impervious clay layer existing beneath the DPS site. The analytical evidence collected during the IRA suggested that contaminants migrated onto the DPS site from an upgradient source, or sources. These contaminants have traversed the site.

With the findings of the IRA as supporting documentation, KEY is submitting a Downgradient Property Status Opinion for the DPS site. It has been prepared in accordance with the processes prescribed by the Commonwealth of Massachusetts Department of Environmental Protection (DEP) in Massachusetts General Laws ch. 21E, 310 Code of Massachusetts Regulation 40.0183.

2.0 DESCRIPTION OF THE DOWNGRADIENT SITE

The DPS site is known as the Pinewood Village Condominiums located at 9 Bells Neck Road in Harwich, Massachusetts. The Pinewood Village Condominiums is a 2.16 acre parcel of land which contains 16 detached single family cottages. The site is referenced by the Harwich Assessor's Office as Lots 1 through 16, Block F-1, on Sheet 10. The DPS site is located north of the intersection of Route 28 and Depot Street in Harwich. The Harwich - Dennis town limit is located approximately 2,000 feet west of the site. See Figure 1 - Site Location Plan on the following.

Each individual cottage is serviced by its own subsurface sewage disposal system. The site is also serviced by overhead electric, natural gas, telephone and cable. The Pinewood Village Condominium Association is currently in the process of connecting to municipal water to be supplied by the Town of Harwich. The DPS site can be accessed from Bells Neck Road and Mansion Street. See Figure 2 - Site Schematic on the following page.

The DPS site has been utilized for residential purposes since its original site improvements to the property. Current and historical site use does not include the use, store or generate OHMs.

3.0 DESCRIPTION OF THE DISPOSAL SITE

There are three properties within 250 feet and upgradient of the DPS site which historically used, stored, and generated OHMs and are considered potential sources of the contamination revealed at the DPS site. A clothes dry cleaning operation operated on the abutting property located at #72 Route 28 during the 1960s and 1970s. Dry cleaning operations involve the use, storage, and generation of significant quantities of hazardous materials. The OHMs include the chlorinated solvents revealed within the ground water on the DPS site, and within the ground water on several other downgradient properties. This property is directly upgradient of the DPS site. See Figure 2 - Site Schematic.

Orleans Auto Supply, located at #66 Route 28, was historically known as Brothers Automotive. This property abuts the DPS site to the south. Automotive services involve the use, storage, and generation of OHMs. The OHMs include the chlorinated solvents, TPH and metals revealed within ground water samples obtained at the DPS site, and several other downgradient properties. Note that PCE at a concentration of 40.0 parts per billion (ppb) was revealed in a ground water sampled obtained from an existing well on this property during the September 1997 sampling event conducted by the Town of Harwich Board of Health. This property is hydrogeologically upgradient of the DPS site.

A Gulf gasoline and service station was historically located at #55 Route 28. The property is located approximately 240 feet southwest of the DPS site. This gasoline station was in operation from approximately 1950 to 1987. Gasoline and service station operations involve the use, storage and generation of significant quantities of OHMs. These OHMs include the chlorinated solvents and metals revealed in ground water samples obtained from the DPS site, and several downgradient properties. This property is hydrogeologically upgradient of the DPS site.

4.0 RELEASES AT THE DISPOSAL SITES

State and Federal standard environmental records sources did not reveal any documented releases of oil or hazardous materials at the three identified potential Disposal Sites. Standard environmental records did not reveal any currently registered underground storage tanks (USTs) within 0.25 miles of the DPS site. However, historical activities clearly indicates the use, storage, and generation of OHMs at the potential Disposal Sites identified by KEY in this DPS Opinion.

5.0 HYDROGEOLOGICAL CONDITIONS

The site is located on the United States Geological Survey (USGS) Quadrangle - Harwich, Massachusetts, 1974. According to the topographical map, the site is situated at an elevation of approximately elevation 10.0 feet above mean sea level. Topographic relief on the site is relatively undifferentiated.

Review of the DEP - BWSC Priority Resource Map for the Harwich, Massachusetts topographic quadrangle revealed that the site is located within a EPA-designated Sole Source Aquifer. In accordance with 310 CMR 40.0362, the site is located in an area mapped as a Ground Water Reporting Category 1 (RCGW-1). Likewise, in accordance with 310 CMR 40.0361, site soils are included in Soil Reporting Category RCS-1, because the soil samples obtained are from a GW-1 mapped area.

Subsurface exploration revealed an unconfined aquifer underlying the site consisting of well sorted loose to medium dense sands. A impermeable clay layer was encountered at approximately 47 feet below grade. According to the *Geologic Map of the Harwich Quadrangle, Barnstable County, Cape Cod, Massachusetts*, dated 1969, the site is underlain with Harwich outwash plain deposits. Below this formation is a proglacial lake deposit (clay) which has a characteristically flat upper surface. This published data was confirmed in the subsurface exploration completed by KEY as part of the IRA.

The following details instrument survey information and data obtained during the completion of the IRA, to establish ground water elevations. The elevations are based on N.G.V.D. The ground water monitoring wells were gauged on 11/21/97.

TABLE 5.1 GROUND WATER ELEVATION DATA

<u>WELL NUMBER</u>	<u>RISER ELEV.(FT)</u>	<u>WATER DEPTH (FT)</u>	<u>WATER ELEVATION (FT)</u>
MW-1	11.73	8.05	3.68
MW-2	15.31	11.50	3.81
MW-3	15.35	11.45	3.90
MW-4	18.19	Dry	--

Ground water flow direction was calculated to be from the southwest to northeast. Horizontal hydraulic gradient was calculated to be 7.51×10^{-4} feet per foot. The ground water elevations calculated by KEY were confirmed by published data. The U.S.G.S. study titled *Water Table Map of Brewster and Harwich, Massachusetts: September 21 to October 22, 1987* reveals the ground water flow direction to be from the southwest to northeast. See Figure 3, Water Table Map - Towns of Brewster and Harwich and Appendices A & B, Site Plan - Pinewood Village Condominiums in Harwich, Mass. & Hydrogeological Calculations.

The concentrations of VOCs revealed within the ground water samples obtained at the DPS site as part of the IRA as described in Section 1.0 of this DPS Opinion, were significantly lower than those concentrations revealed during the August and September sampling events performed by the DEP and the Harwich Board of Health, respectively. During the August and September sampling rounds, the on-site public water supply well was in use. This pumping likely created a localized cone of depression towards the well head, drawing in ground water from the influenced area. Analytical findings revealed during the IRA reflect non-pumping conditions.

6.0 NEED FOR IMMEDIATE RESPONSE ACTIONS

The NOR issued for the DPS site identified an Imminent Hazard Condition in accordance with 310 CMR 40.0320 and mandated the completion of an IRA. An IRA has been conducted in accordance with a DEP-approved IRA Plan. The IRA Completion Report was submitted to DEP on January 18, 1998. In addition to the assessment only IRA, the on-site Public Water Supply Well has been shut down. Based upon the findings of the IRA, it is our opinion that there is no need to conduct additional IRAs at the DPS site.

7.0 FINDINGS AND CONCLUSIONS

In January and February 1998, KEY Environmental Services, Inc. (KEY) completed a Downgradient Property Status (DPS) Opinion for property referenced as the Pinewood Village Condominiums located at 9 Bells Neck Road; in Harwich, Massachusetts (the DPS site). The project was performed in accordance with customary principles and practices in the fields of environmental science and engineering; and processes prescribed by the Commonwealth of Massachusetts Department of Environmental Protection (DEP) in Massachusetts General Laws ch 21E, 310 Code of Massachusetts of Regulations 40.0183.

In November and December 1997 and January 1998, KEY Environmental Services, Inc. (KEY) completed an Immediate Response Action (IRA). The IRA was mandated by the Department of Environmental Protection (DEP) via the Notice of Responsibility (NOR) With Interim Deadlines, dated September 18, 1997 for the Pinewood Village Condominiums, located at 9 Bells Neck Road in Harwich, Massachusetts, DEP Release Tracking No. 04-13326 (the site).

The NOR addressed a known release of volatile organic compounds (VOCs) at the site which exceeded the allowable Massachusetts Contaminant Levels for drinking water. Certain contaminant concentrations detected exceeded their current Reportable Concentrations (RC) for a Groundwater Category 1 (RCGW-1) established in the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000. Trichloroethylene (TCE) and Tetrachloroethylene (PCE) concentrations detected were ten (10) times the RCGW-1 standards. This finding constituted an Imminent Hazard Condition in accordance with 310 CMR 40.0320.

A "DO NOT USE ORDER" - Administrative Order was issued by the DEP to the Pinewood Village Condominium Association (the Association). In compliance with the Order, the Association notified all customers and ceased use of the non-community public water supply system at the site. The Association is in the process of connecting to the Town of Harwich municipal water system. The IRA Plan was submitted to DEP on October 9, 1997. The plan received presumptive approval on October 29, 1997.

The NOR issued for the DPS site identified an Imminent Hazard Condition in accordance with 310 CMR 40.0320 and mandated the completion of an IRA. An IRA has been conducted in accordance with a DEP-approved IRA Plan. The IRA Completion Report was submitted to DEP on January

18, 1998. In addition to the assessment only IRA, the on-site Public Water Supply Well has been shut down. Based upon the findings of the IRA, it is our opinion that there is no need to conduct additional IRAs at the DPS site.

The DPS site is a 2.16 acre contiguous parcel of land which contains 16 detached single family cottages. The DPS site has been utilized for residential purposes since its original site improvements to the property. Current and historical site use does not include the use, store or generate oil and hazardous materials (OHMs).

KEY completed a subsurface investigation which involved the installation of four (4) ground water monitoring wells in accordance with the approved IRA Plan. The monitoring wells and their screened intervals were horizontally and vertically placed on the site to assess for the migration of contaminants onto the site from off - site properties which historically used, stored and generated OHMs and to assess for evidence of the release originating on the site.

Subsurface exploration revealed an unconfined aquifer underlying the site consisting of well-sorted loose to medium dense sands. An impermeable clay layer was encountered at approximately 47 feet below grade. Ground water flow direction was calculated to be from southwest to northeast. The horizontal hydraulic gradient is 7.51×10^{-4} feet per foot.

Ground water and soil at the site were sampled and analyzed for VOCs utilizing Method 8240, Total Petroleum Hydrocarbons (TPH) utilizing Method 8015B, lead, and chromium. The ground water analytical results revealed tetrachloroethene, trichloroethene, and cis-1,2 Dichloroethene at concentrations of 97.0, 5.0, 5.0 parts per billion, respectively, and TPH at a concentration of 0.86 parts per million. The soils obtained during advancement of the bore holes at the DPS site revealed detectable levels of TPH, lead, and Methylene Chloride. The concentrations detected did not exceed their respective Reportable Concentrations for an S-1 category.

KEY's subsurface investigation did not reveal a dense nonaqueous phase liquid (DNAPL) pool of contaminants atop the impervious clay layer existing beneath the site. The analytical evidence collected during the IRA suggested that contaminants have migrated onto the site from an upgradient source, or sources. These contaminants have traversed the site and have continued to migrate onto other downgradient properties.

Three properties within 250 feet and upgradient of the DPS site historically used, stored, and generated OHMs and are considered potential sources of ground water contamination on the DPS site. A clothes dry cleaning operation operated on the abutting property (#72 Route 28) during the 1960s and 1970s. The property located at #66 Route 28 was historically occupied by Brothers Automotive. This property abuts the DPS site to the south. A Gulf gasoline and service station operated the property referenced as #55 Route 28, located approximately 240 feet southwest of the DPS site, from approximately 1950 to 1987.

The findings of the Assessment Only - Immediate Response Action performed at the site by KEY uncovered that the source of the release revealed at the DPS site was located on one or more upgradient properties identified in this submittal. Contaminants from that source, or sources, have come to be located at the DPS site as a result of migration of the material in the ground water.

With the findings of the IRA as supporting documentation, KEY is submitting a Downgradient Property Status Opinion for the DPS site. It has been prepared in accordance with the processes prescribed by the Commonwealth of Massachusetts Department of Environmental Protection (DEP) in Massachusetts General Laws ch. 21E, 310 Code of Massachusetts Regulation 40.0183.

8.0 REFERENCES

8.1 Commonwealth of Massachusetts Department of Environmental Protection

Bureau of Waste Site Cleanup - Priority Resources Map, Harwich Quadrangle

8.2 United State Geologic Survey

Topographical Map - Harwich, Massachusetts Quadrangle, dated 1974

Geologic Map of Harwich Quadrangle, Barnstable County, Cape Cod, Mass., 1969

Water Table Map of Brewster and Harwich, Massachusetts - 09/21/87 to 10/22/87.

8.3 Town of Harwich

Assessor's Office, Records and Maps Review

Board of Health, Records Review & Personal Interview - Paula Champagne, Agent

Town Clerk, Records Review

Building Department, Records Review

8.4 Town of Dennis

Assessor's Office, Personal Interview, Tanya Denault, Agent

Water Department, Personal Interview, Water Superintendent

8.5 Other Sources

Immediate Response Action Completion Report, dated January 18, 1998; prepared by KEY Environmental Services, Inc.

Barnstable County, Cape Cod, Massachusetts Heath Dept. Laboratory

Environmental FirstSearch Report, dated 01/15/98

9.0 REPORT LIMITATIONS

This Downgradient Property Status Opinion has been performed, findings obtained, and recommendations prepared in accordance with customary principles and practices in the fields of environmental science and engineering; and processes prescribed by the Commonwealth of Massachusetts Department of Environmental Protection (DEP) in Massachusetts General Laws ch 21E, 310 Code of Massachusetts Regulation 40.00, and attending guidance documents. This statement is in lieu of all other statements either expressed or implied.

Environmental site assessments are inherently limited in the sense that conclusions are drawn and recommendations are developed from limited inquiry and the site reconnaissance. Additionally, the passage of time may result in a change in the environmental conditions at the site and surrounding properties. This report does not warrant against future operations or conditions, nor does this warrant operations or conditions present of a type or at a location not investigated.

**LAND PLANNING, INC.**

Civil Engineers • Land Surveyors • Environmental Consultants

1115 Main Street, Hanson, Massachusetts 02341

WELL ELEVATIONS

*PINEWOOD VILLAGE CONDOMINIUMS
IN WEST HARWICH, MA
JOB NO. P-956*

*WELL NO. B1 - GROUND ELEV. = 12.3
TOP WELL COVER = 12.27
TOP PVC = 11.73*

*WELL NO. B2 - GROUND ELEV. = 15.8
TOP WELL COVER = 15.76
TOP PVC = 15.31*

*WELL NO. B3 - GROUND ELEV. = 15.6
TOP WELL COVER = 15.61
TOP PVC = 15.35*

*WELL NO. B4 - GROUND ELEV. = 18.8
TOP WELL COVER = 18.69
TOP PVC = 18.19*

NOTE: ELEVATIONS BASED ON N.G.V.D., BENCHMARK U.S.G.S. DISK RM8, EL. = 17.86

HYDRO GEOLOGICAL CALCULATIONS

GROUND WATER ELEVATIONS

<u>WELL NUMBER</u>	<u>RISER ELEVATION</u>	<u>WATER DEPTH</u>	<u>WATER ELEVATION</u>	<u>RELATIVE ELEVATION</u>
mw1	11.73'	8.05'	3.68'	L
mw2	15.31'	11.50'	3.81'	M
mw3	15.35'	11.45'	3.90'	H
mw4	18.19'	DRY	—	—

GROUND WATER DIRECTION

<u>RELATIVE ELEVATION</u>	<u>WELL NUMBER</u>	<u>WATER ELEVATION</u>
H	mw3	3.90'
L	mw1	3.68'
Δ	=	0.22'

<u>RELATIVE ELEVATION</u>	<u>WELL NUMBER</u>	<u>WATER ELEVATION</u>
H	mw3	3.90'
M	mw2	3.81'
Δ	=	0.09'

HORIZONTAL HYDRAULIC GRADIENT

$$\begin{aligned}
 &= \Delta H / \Delta L \\
 &= [3.90' (mw3) - 3.68' (mw1)] / 293' \\
 &= 0.22' / 293' = 7.51 \times 10^{-4}
 \end{aligned}$$

500 SHEETS PER CASE
250 SHEETS PER CASE
100 SHEETS PER CASE
50 SHEETS PER CASE
25 SHEETS PER CASE
10 SHEETS PER CASE
5 SHEETS PER CASE
2 SHEETS PER CASE
1 SHEET PER CASE
1/2 SHEET PER CASE
1/4 SHEET PER CASE
1/8 SHEET PER CASE
1/16 SHEET PER CASE
1/32 SHEET PER CASE
1/64 SHEET PER CASE
1/128 SHEET PER CASE
1/256 SHEET PER CASE
1/512 SHEET PER CASE
1/1024 SHEET PER CASE
1/2048 SHEET PER CASE
1/4096 SHEET PER CASE
1/8192 SHEET PER CASE
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SCANNED

SITE INVESTIGATION REPORT

HARWICH PCE/TCE STUDY AREA

SARSS IV CONTRACT EQEJ217

PROJECT NO. 100687

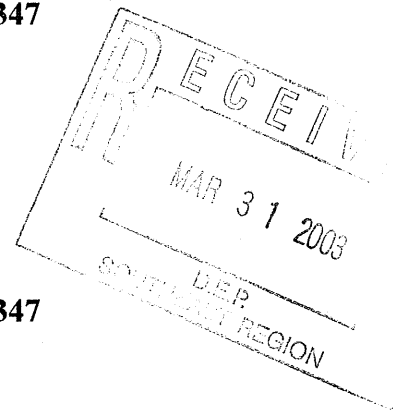
RTN 4-13326

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VOLUME I

March 2003

**SITE INVESTIGATION REPORT
HARWICH PCE/TCE STUDY AREA
SARSS IV CONTRACT EQEJ217
PROJECT NO. 100687**

1. INTRODUCTION

1.1 Overview

This report summarizes site discovery and site investigation activities conducted for the Harwich PCE/TCE Site study area located in West Harwich, Massachusetts. Site investigation activities were initiated under the Massachusetts Department of Environmental Protection (DEP) Site Assessment and Remediation Support Services (SARSS) III contract and continued under SARSS IV contract.

Under the SARSS III contract, SAIC performed several investigation activities within the study area. These activities focused on collecting data to define the distribution of tetrachloroethylene (PCE) and trichloroethylene (TCE) contaminated groundwater in Harwich. The contaminated groundwater is located near the Town boundary with Dennis and extends easterly and northeasterly toward North Road. Activities conducted under the SARSS III contract included:

- Review of files provided by DEP.
- Vertical profiling of groundwater quality at eleven locations (SAIC-HD-101 through SAIC-HD-111) using small diameter direct push technology to obtain groundwater samples at 10-foot intervals. Upon reaching the bottom of the aquifer (i.e., silt layer) the direct push probe used to collect the groundwater samples was left in place to provide a deep groundwater monitoring point.
- Vertical profiling of groundwater at twelve additional locations, which were completed as microwells (SAIC-HD-112 through SAIC-HD-123). Groundwater was sampled in ten-foot intervals during advancement of the microwell.
- Indoor air sampling at 12 residential locations and the Harwich Town library to assess potential impacts to indoor air from the groundwater contamination plume.
- Installation and development of five 2-inch shallow groundwater table monitoring wells.
- Survey of location and elevation of microwells and 2-inch groundwater monitoring wells.
- Review of historical data and interviews with Town of Dennis and Harwich Health officials regarding former property uses in the area.
- Submission of a draft report summarizing all activities and findings, to date, on May 30, 2000.

Under the SARSS IV contract, SAIC conducted supplemental investigation activities to provide additional information to further define the distribution of PCE and TCE groundwater contamination and assess impacts to potential receptors. Work conducted under SARSS IV generally focused on the northeastern portion of the study area in the vicinity of North Road and involved:

- Additional indoor air sampling and analysis to assess the potential for indoor impacts associated with the PCE/TCE plume;
- Installation of ten "in-plume" microwells across the study area that correspond to the locations and depth intervals of maximum PCE/TCE concentrations previously reported during SARSS III groundwater screening activities. Vertical profiling of groundwater was not conducted during the advancement of these microwells.
- Installation of six shallow (0-10 feet) microwells along North Road;
- Monitoring well sampling and analysis; and
- Survey of newly installed microwells.

At the request of DEP, four groundwater monitoring wells at Pinewood Village Condominiums (9 Bells Neck Road) were also sampled and analyzed for volatile organic compounds (VOCs) as part of the SARSS IV investigation.

1.2 Study Area Description

The study area comprises an area of approximately one square mile located in the vicinity of Route 28 and Division Street at the Harwich/Dennis Town line (See Figure 1). The study area encompasses an area bound by Depot Street to the west, Center and Kelly Streets to the south, and the Herring River tidal estuary system to the north and east. Locations of roadways, surface water bodies, and property boundaries are provided on Figure 2. The majority of the study area is developed with residential property. However, land along Division Street and Route 28 is also developed with commercial properties.

Topography of the study area is relatively flat with elevations ranging from sea level at Herring River to 9 feet above mean sea level (msl) along Smith Street and 14 feet msl at the intersection of Division Street and Route 28 (refer to Figure 1). The nearest surface water body is the Herring River, which defines the eastern bounds of the study area and discharges to the Atlantic Ocean approximately 4,000 feet south of the study area.

2. RELEASE HISTORY

In August 1997, chlorinated solvents initially were detected in a sample from the drinking water supply well at the Pinewood Village Condominiums located 9 Bells' Neck Road (RTN 4-13326), West Harwich. Subsequent sampling at Pinewood Village and nearby single-family residences by the Harwich Board of Health identified elevated TCE and PCE concentrations in residential water supply wells located along North Road (61, and 65 North Road), and 66 Route 28. Water samples from irrigation wells at 53 North Road and 44 Smith Street also contained elevated concentrations of TCE and PCE. Results of Harwich Board of Health Sampling are presented in Appendix A.

Residences along North Road and Pinewood Village were connected to a municipal water supply line in November 1997. At that time, the Town of Harwich required that residential water supply wells along North Road be permanently disconnected from indoor plumbing.

3. INITIAL SAIC INVESTIGATION ACTIVITIES (1999 and 2000)

3.1 Town Hall and DEP File Review

SAIC conducted an initial review of records provided by DEP and the Harwich and Dennis Town Halls regarding current and past use of chlorinated solvents within the study area.

DEP provided SAIC with notes taken during an informational meeting between DEP and Harwich Town officials on September 19, 1997. These notes identify Dowd's Cleaners (with possible dry cleaning operations) as located at the property now occupied by Aubuchon Hardware on Main Street. (The location of Aubuchon Hardware is shown on Figure 2.)

Available tax assessor's records for the Towns of Harwich and Dennis provided no information regarding the historic uses of commercial properties. According to Harwich Town Hall personnel, the parcel of land that is currently occupied by Brook's Pharmacy (corner of Route 28 and Division Street; refer to Figure 2) was formerly a dry cleaner. However, no written documentation regarding former dry cleaning operations at this location was available.

A review of the DEP Sites/Reportable Releases database was conducted to ascertain whether there were reported spills or releases of PCE/TCE solvents within the study area. A review of this database indicated that three listed Sites, with PCE as a contaminant of concern, are located within the study area. These sites are described below and property locations are shown on Figure 2.

Craftsbury Realty Trust (RTN 4-12054)

This property is located at 18 Hall Street at the intersection of Hall Street and Route 28 in Dennisport, MA. The property is approximately 0.58 miles southwest of North Road. Chlorinated VOCs were first reported in groundwater at this property in 1993. While chlorinated VOCs were reported at all on-site wells, maximum PCE/TCE concentrations were reported at the monitoring well (MW-3) directly downgradient of Dennisport Coin Operated Laundry (13 Hall Street, RTN 4-12832). Subsequent sampling of groundwater from this well in 1994, 1995 and 1996 revealed combined maximum PCE/TCE groundwater concentrations of 45 micrograms per liter ($\mu\text{g/L}$), 74.2 $\mu\text{g/L}$ and 1,090 $\mu\text{g/L}$, respectively (DEP 1997). On behalf of the owner of 18 Hall Street, Fugro-East filed a Downgradient Property Status Submittal (DPS) for this property in November 1996. DEP subsequently issued a Notice of Responsibility (NOR) to Dennisport Coin Operated Laundry on February 12, 1997.

Dennisport Coin Operated Laundry (RTN 4-12832)

This site is located at 13 Hall Street, approximately 0.6 miles southwest of North Road. This property has been the location of a laundromat since 1959 (K-V 1997). Dry cleaning operations were conducted at this property from 1964 until 1997. As of 1997, several thousand to tens-of-thousands of gallons of gray water have been discharged to the subsurface daily. Gray water from laundry operations was disposed of at several locations on the property as listed below:

1959-1970	Seven cesspool/leaching devices located on northeastern corner of property
1970-1972	Discharge to an open pit
1972-1984	Discharge to amoration pits in "sideyard"
1984-present	Leaching trench system on south and west portions of property

PCE was formerly stored in a 225-gallon steel above-ground storage tank (AST) at this property. In addition, during a site walkover by Olde Boston Associates in 1987, two 55-gallon drums of virgin and four 55-gallon drums of waste PCE were observed in the laundromat building (K-V 1997).

A subsurface investigation by K-V Associates in 1997 revealed a maximum PCE concentration of 17,000 µg/L in shallow groundwater (1-11 feet below grade [fbg]) adjacent to the former cesspools on the northeastern corner of property. In addition, 270 µg/L of TCE and 890 µg/L of cis-1,2-dichloroethene were reported in groundwater at this location. Additional groundwater sampling from a deeper well (25-30 fbg) reported a maximum PCE groundwater concentration of 33,000 µg/L and 4,100 µg/L of TCE (K-V 1998). K-V Associates concluded that groundwater flow directions from this property is likely to be radial, due to the presence of a groundwater mound from the daily discharge of high volumes of water to the subsurface.

On February 12, 1997, DEP issued a Notice of Responsibility to Dennisport Coin-Operated Laundry. The site was classified as Tier II on February 18, 1998. On January 7, 2003, DEP issued a Notice of Noncompliance (NON-SE-03-37-007), establishing deadlines for submittal of Tier II Extension, and Phase Reports. A Tier II Extension and Release Abatement Measure Plan were submitted to DEP on January 31, 2003.

Pinewood Village Condominiums (RTN 4-13326)

This site is located at 9 Bell's Neck Road in the approximate center of the study area. A Notice of Responsibility (NOR) was first issued by DEP to Pinewood Village in September 1997 after elevated PCE concentrations, in excess of applicable Massachusetts Contingency Plan (MCP) GW-1 Reportable Concentrations (RCs) for groundwater were detected at an onsite water supply well at this property. According to a Key Environmental, Inc., *Immediate Response Action (IRA) Completion Report* dated January 18, 1998 (Key 1998a) and *Supplemental IRA Completion Report* dated August 1998 (Key 1998b), chlorinated solvents were not reported in shallow groundwater (10-30 fbg), but only in deeper groundwater (40 -50 fbg) beneath Pinewood Village. Key Environmental concluded that deeper groundwater at Pinewood Village was impacted from an off-site source. Key Environmental identified, through anecdotal information obtained from Harwich municipal employees, that dry cleaning operations were formerly located at 72 Main Street, which abuts Pinewood Village property to the south (refer to Figure 2 for location). No written documentation regarding former dry cleaning operations at this location was available from Harwich Town offices, during the SAIC investigation.

3.2 Field Investigation – 1999-2000

Under the SARSS III contract, DEP contracted SAIC to conduct vertical profiling of groundwater using small diameter driven well technology to evaluate the extent of PCE and TCE groundwater contamination within the study area. Vertical profiling involved advancing a small

diameter well (microwell) to the desired depth below the water table, collecting a groundwater sample and then adding riser pipe and advancing the microwell to the next (deeper) sampling depth interval, and collecting a groundwater sample. This iterative process of driving pipe, sampling, and then advancing the microwell ten (10) feet deeper and sampling, continued at each vertical profiling location until the apparent boundary of the aquifer was encountered. Once the apparent base of the aquifer was encountered, the microwell was left in place to allow for future monitoring of water levels and groundwater quality.

Groundwater profiling locations were based, in part, on available property use data and were chosen to provide information on the distribution and potential source areas of PCE/TCE groundwater contamination. Sampling locations are shown on Figure 2. All micro-well installation and sampling activities were conducted in accordance with *DEP Standard Reference for Monitoring Wells* dated April 1991 (publication #WSC-310-91) and *Small Diameter Driven Well Supplement* (January 1999).

Field activities conducted in 1999 included vertical profiling of groundwater at 11 locations (Well Nos. SAIC- HD-101 through SAIC-HD-111). Groundwater samples collected from the microwells were analyzed in the field by MyKroWaters Inc., for PCE and TCE using a portable gas chromatograph (GC). Groundwater samples obtained from the interval at which highest PCE/TCE concentrations were detected during field screening activities were forwarded to a fixed-base laboratory (Toxikon) for confirmatory VOC analysis by EPA Method 8260B.

In May 2000, vertical groundwater profiling was conducted at 12 additional locations (SAIC HD-112 through SAIC HD-123) to more accurately delineate the previously detected groundwater contamination plume. Again, groundwater samples collected from the microwells were analyzed in the field by MyKroWaters Inc., for PCE and TCE using a portable GC and selected samples were submitted to Toxikon for VOC analysis by EPA Method 8260B. During the May 2000 vertical profiling activities, microwells were installed at four locations (SAIC HD-118, -119, -120, and -123), to allow for future monitoring of water levels and shallow groundwater quality. A brief summary of the vertical profiling information and field screening results is presented in MyKroWaters' reports dated July 9, 1999 and May 16, 2000 (Appendix B).

Other field activities conducted in May 2000, involved installation of five 2-inch diameter groundwater monitoring wells (SAIC-MW-1 through SAIC-MW-5). These monitoring wells were installed at strategic locations to monitor water table elevations across the study area. Each well was drilled by D.L Maher Co., using a 4.25-inch inner diameter hollow stem auger and constructed with 2-inch diameter PVC riser and screen. Well completion information is presented in Appendix C.

During 2000, surveying of the locations and elevations of microwells and 2-inch monitoring wells was conducted by a Massachusetts registered land surveyor, Boucher and Heureux, Inc. of Westport, MA. All elevations are reported relative to mean sea level (msl) based on the National Geodetic Vertical Datum (NGVD) 29.

3.3 Subsurface Conditions and Groundwater Flow

Because groundwater profiling and microwell installation were completed using direct push technology, direct observation of the unconsolidated deposits was not possible. Therefore, only a generalized stratigraphy of unconsolidated deposits beneath the study area was inferred from change in purge water color and silt content and changes in resistance encountered during the advancement of microwells. These observations suggested that the study area is underlain by a brown medium sand and silt unit. At the base of this brown sand unit there appears to be a dense gray silt unit that is assumed to define the base of the aquifer. Depth to the dense gray silt layer appears to range from roughly 45 fbg (at well SAIC-HD-101) to 65 fbg (at SAIC-HD-104). A generalized cross-section showing the approximate depth of the gray silt unit is presented in Figure 3.

On May 17, 2000, the depth to water was obtained from wells screened across the groundwater table. Depth to groundwater measurements are shown on Table 1 and groundwater contours are presented in Figure 4. These contours suggest a very slight hydraulic gradient and northeasterly direction of groundwater flow toward the Herring River.

3.4 Groundwater Analytical Results - 1999 and 2000

During vertical profiling, a total of 154 groundwater samples were collected and analyzed in the field for PCE and TCE by a chemist from MyKroWaters using a mobile gas chromatograph (GC). Thirty-six (36) split samples were also collected and sent to a fixed-base analytical laboratory (Toxikon) for analyses for the presence of VOCs using Method 8260B. Field GC and fixed-base lab results are summarized in Table 2. Copies of analytical results received from Toxikon have been included in Volume II of this report. Field GC results are also presented in MyKroWaters' field summary report included as Appendix B.

A comparison of fixed-base laboratory results with the field GC screening results indicates that the correlation between field GC results and the laboratory data appeared to be high. Results for the majority of samples submitted to the laboratory for verification of the field results were within $\pm 15\%$ for both PCE and TCE.

3.4.1 Distribution of PCE and TCE Contamination

PCE and TCE were detected in groundwater at 19 of the 23 vertical profiling locations (refer to Table 2). Figures 3 and 5 present isoconcentration contours (isocons) developed using the maximum combined PCE/TCE concentrations (laboratory) data; Figure 3 shows a cross-sectional view of the distribution of PCE/TCE and Figure 5 shows the distribution in plan-view. It is noted, that the isocons shown in Figures 3 and 5 are based on laboratory data for water samples obtained during vertical profiling activities and do not incorporate the results from K-V Associates 1997 investigation at 13 Hall Street (Dennisport Coin Operated Laundry) which showed maximum PCE and TCE concentrations in groundwater samples collected in 1998 at 33,000 $\mu\text{g/L}$ and 4,100 $\mu\text{g/L}$, respectively (refer to Section 3.1). The isocons also do not incorporate the results of the 1997 sampling of private wells in the study area by the Board of Health.

The vertical profiling data indicate that the highest PCE/TCE concentrations were detected in groundwater at a depth of roughly 30-60 feet below the ground surface. Maximum PCE and TCE concentrations were detected at the 44-54 fbg depth interval at SAIC-HD-107. This sampling location is located in front of Aubuchon Hardware along Main Street (Figure 2). PCE and TCE concentrations generally appear to decrease to the northeast (downgradient) of SAIC-HD-107. However, elevated PCE concentrations were detected at SAIC-HD-101 and SAIC-HD-112, located along North Road. Based on the 1999 and 2000 data, as illustrated in Figure 5, the lateral extent of the TCE/PCE plume was fairly well defined; however, the northeastern and eastern limits of the plume in the vicinity of wetland areas were less well defined.

3.4.2 Comparison to MCP Method 1 Standards

Groundwater screening (field GC) and fixed-base laboratory results were compared to Massachusetts Contingency Plan (MCP) Method 1 Groundwater Standards (Table 2). In general PCE and TCE concentrations in excess of the GW-1 groundwater standard of 5 µg/L for both PCE and TCE were reported in deep groundwater (30-60 fbg) at 17 of the 23 microwell sampling locations. An exceedance of the PCE and TCE GW-1 groundwater standards was also reported in shallow groundwater (0-20 fbg) at microwell profile locations SAIC-HD-101, -104, and -106. As noted in Section 2.0, a municipal water line does exist in the study area.

PCE concentrations reported in groundwater at SAIC-HD-107 (33-54 fbg), near Aubuchon Hardware, exceed the PCE GW-2 and GW-3 groundwater standards of 3,000 µg/L and 5,000 µg/L, respectively. In addition, the TCE concentration in this groundwater sample exceeds the TCE GW-2 standard of 300 µg/L.

No exceedances of the MCP Upper Concentration Limits (UCLs) in groundwater were reported.

3.5 Indoor Air Sampling (1999-2000)

In 1999, SAIC sampled indoor air at three residences within the study area (53, 61, and 65 North Road). (Locations of the residences are shown on Figure 2.) Air sampling was conducted at these residences to assess potential indoor air impacts from groundwater VOC contamination previously reported during the Harwich Board of Health private well sampling event in 1997 and the groundwater investigation conducted by SAIC in 1999.

Air samples were collected over a 24-hour time period using either 6-liter Summa or 6-liter Silco canisters. All samples were submitted to Air Toxics, Ltd for VOC analysis using EPA Method TO-14. At the request of DEP, analytical results were compared to DEP Background Ambient Indoor Air Guidance (BAIA) values (September 1998).

During 2000 the indoor air sampling program was expanded to include sampling of twelve (12) residences and the Harwich Town Library (5 Main Street). Sampling events were conducted in March, May, August, and November of 2000. Air sampling locations are shown on Figure 2. Air sampling results are collectively discussed in Section 6.0 of this report.

4. SAIC INVESTIGATION ACTIVITIES – 2001

Under SARSS IV, SAIC was contracted by DEP to provide additional information to further define the extent of PCE and TCE groundwater contamination and assess impacts to potential receptors. The proposed work generally focused on downgradient (i.e. northeast) portions of the study area in the vicinity of North Road.

4.1 Additional Background Research – 2001

On October 9, 2001 personnel from SAIC and DEP met with Ms. Paula Champagne of the Harwich Board of Health and Mr. John Chatham of Harwich Conservation Commission to discuss investigation activities and results to date, proposed monitoring well locations, private well use within the study area, and any known current or historic dry cleaning operations or other operations that may use solvent containing PCE/TCE. According to Ms. Champagne, two private wells along North Road are reportedly used for irrigation water. One of these wells is located at 53 North Road and the other irrigation well is located on the east side of North Road, north of Henry Dunn Road and south of Smith Street (refer to Figure 5). Ms. Champagne also provided anecdotal evidence, based on her interviews with long-time residents of Harwich, of a former laundry facility (Dowd's Cleaners) at the current location of Aubuchon Hardware, as shown on Figure 2. Ms. Champagne also indicated that dry cleaning facilities were formerly located at the Brook's Pharmacy property located on the corner of Division Street and Route 28 and at West Harwich Professional Office Building at 72 Main Street (Route 28).

Mr. Robert Peterson, long time resident and Chief of the Harwich Fire Department, was also contacted regarding historic industrial properties within the study area. Mr. Peterson did recall that a restaurant, dance hall and laundromat was formerly located at the Aubuchon property. However, Mr. Peterson believed, based on his recollection and his interviews with long-time residents, that it was strictly a laundry facility and not a dry cleaning facility. Mr. Peterson independently confirmed Ms. Champagne's statement that a dry cleaner was formerly located at the current Brook's Pharmacy property (corner of Division and Main Street) and another dry cleaner was formerly located at Harwich Professional building (72 Main Street).

A review of tax and ownership records at the Harwich Assessor's Office in 2001 did not indicate the former uses of properties of interest on the field cards. Harwich has recently computerized its tax assessor information and only limited historical data is kept on-file at the Town Hall.

Ms. Tanya Daignault of the Town of Dennis Board of Health was contacted regarding current of historic uses of PCE/TCE solvents in the western portion of the study area. Ms. Daignault indicated that a current DEP Site (RTN 4-12832), Dennisport Coin Operated Laundry at 13 Hall Street was formerly a dry cleaner and disposed of wastewater into an on-site septic system.

4.2 Indoor Air Sampling – 2001

In 2001, indoor air samples were again collected at 65 and 93 North Road as well as residences located at 54 Smith Street and 15 Bells Neck Road. At the request of DEP, the dirt crawl spaces beneath the residences on Smith Street and Bells Neck Road were sampled to further assess

indoor air quality in residences located "mid-plume", where PCE impacted groundwater is overlain by approximately 30 feet of clean groundwater. Air sample results are discussed, along with 1999 and 2000 air sampling results in Section 6.0 of this report.

4.3 Field Investigation – 2001

Between October 15-17, 2001 SAIC personnel observed additional microwell installation activities conducted by MyKroWaters, Inc. Vertical profiling of groundwater for PCE and TCE by field GC was not conducted; samples were sent to Woods Hole Group Environmental Laboratory for VOC analysis by EPA Method 8260B.

A total of 16 microwells were installed at the 14 proposed locations as illustrated on Figure 2 - Site Plan. Nine (9) wells were installed as "in-plume" microwells. Depths of "in-plume" microwells were selected to correspond with the depth of maximum combined PCE/TCE concentrations identified in the adjacent well during the 1999 and 2000 groundwater vertical profiling activities. Five (5) shallow microwells (0-10 feet) were installed along North Road and shallow/intermediate well couplets were installed at two (2) locations (SAIC-HD-129/129W and SAIC-HD-133/133W). SAIC-HD-129W was installed as a water table gauging location only, because existing water table well SAIC-MW-2 was destroyed by a snowplow. Well locations and target depths are summarized in Table 3.

Locations and elevations of newly installed microwells were surveyed by a Massachusetts registered land surveyor, Boucher and Heureux, Inc. The locations of the microwells installed in 2001 are shown on Figure 7.

4.4 Groundwater Sampling

On October 22 and 23, 2001 SAIC personnel collected groundwater samples from 15 of the newly installed microwells. Groundwater samples were also collected from four (4) existing monitoring wells located on Pinewood Village property. Prior to sampling, each well was purged of approximately three well volumes. Samples were collected from each well and sent to Woods Hole Labs for VOC analysis by EPA Method 8260B. In addition, a trip blank, two duplicates and cooler temperature blank were submitted in accordance with QA/QC contract requirements.

4.5 Well Gauging Results – 2001

On October 23, 2001, depth to groundwater was obtained from a total of 15 wells that are screened across the groundwater table. Depth to groundwater measurements are summarized in Table 1 and groundwater flow direction is presented on Figure 6.

4.6 Groundwater Analytical Results – October 2001

The October 2001 sampling locations with combined PCE/TCE isocons are presented on Figure 7. The results of the 2001 groundwater sampling indicate that the highest PCE/TCE concentration (1,300 µg/L) was detected at SAIC-HD-127 (50-60 fbg), located on Belmont Road. This location is east of the area (SAIC-HD-107) of high PCE/TCE concentration (6,530

µg/L) identified during the 1999 and 2000 fieldwork. The combined PCE/TCE concentration at the in-plume microwell installed adjacent to SAIC-HD-107 was reported to be 894 µg/L versus the 1999 value of 6,530 µg/L. None of the shallow wells (0-10 feet) installed along North Road showed detectable concentrations of VOCs. Groundwater analytical results for 2001 are summarized in Table 4 and copies of the laboratory reports have been included in Volume II of this report.

Groundwater analytical results were compared to MCP Method 1 Groundwater Standards. GW-1 exceedances for PCE and TCE were reported at eight of the nine "in-plume" microwells installed adjacent to and at the depth interval where GW-1 exceedances were previously reported during SARSS III investigation activities.

No GW-2 or GW-3 exceedances were reported in groundwater samples collected in 2001.

No exceedances of the MCP Upper Concentration Limits (UCLs) for groundwater were reported.

4.7 Comparison of Historic and Current Groundwater Analytical Results

The screened intervals of October 2001 "in-plume" microwells correspond to depths of maximum PCE/TCE concentrations detected during previous groundwater profiling activities. PCE/TCE isocons generated from the 1999/2000 and 2001 data are provided on Figure 7 for comparison purposes. The two sets of isocons shown on Figure 7 indicate that the overall shape and extent of the plume is similar. However, PCE/TCE groundwater concentrations appear to have decreased in intermediate depth groundwater at the upgradient, southwest end, of the plume. Combined PCE/TCE groundwater concentrations have decreased at well locations SAIC-HD-107/126 (6,530 µg/L to 894 µg/L respectively) and SAIC-HD-104/125 (1,174 µg/L to 34 µg/L, respectively). Concentrations at SAIC-HD-122/127 have remained constant.

5. INVESTIGATION DERIVED WASTE (IDW)

All soil cuttings and liquid IDW generated during each phase of this study were transferred into 55-gallon drums and staged within a secure location at the Town of Harwich Fire Department. Clean Harbors, Inc. subsequently characterized and disposed of IDW at an appropriately licensed receiving facility. Manifests for IDW shipment are presented in Appendix D.

6. INDOOR QUALITY ASSESSMENT

Indoor air quality was sampled at a total of 15 residences during the course of this investigation. Air sampling locations and sampling dates are provided on Figure 7. Indoor air samples were collected over a 24-hour continuous sampling interval using either 6-liter Summa or 6-liter Silco canisters, which were certified clean by the laboratory. All samples were submitted to Air Toxics, Ltd for VOC analysis using EPA Method TO-14. The laboratory's reports are presented in Volume II and summarized in Table 5. At the request of DEP, analytical results were compared to DEP's Background Ambient Indoor Air (BAIA) levels (DEP 1998).

The contaminants of concern (COC) for indoor air sampling are PCE, TCE and associated degradation compounds previously detected in the groundwater plume. Other, non-chlorinated, VOCs were reported in indoor air samples and are discussed in detail in the previous submittals by SAIC to DEP and are not included in this discussion. Copies of these memorandums are included as Appendix E. To date, the only COC detected in indoor air has been PCE, which has been detected in basement samples collected from 61, 65, and 93 North Road and in a first floor living space sample at 65 North Road. These sampling locations are briefly described below.

61 North Road

This residence has a full basement that is constructed of poured concrete walls and floor. The concrete floor of the furnace and pump room was observed to be broken with exposed dirt patches during a site walkover in June 1999. This location was chosen as an air sampling location as it represents a potential worst-case scenario for VOC accumulation.

PCE air concentrations of 15 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$), $25 \mu\text{g}/\text{m}^3$ and $8.6 \mu\text{g}/\text{m}^3$ were reported from basement closet air samples collected on June 15, 1999, March 1, 2000 and April 5, 2000 respectively. The DEP BAIA value for PCE in indoor air is $11 \mu\text{g}/\text{m}^3$. No PCE or other COCs were detected in the basement living area sample or air sample obtained from the first floor in April 2000. This property was transferred to a new owner after the April 5, 2000 sampling event and access has not been granted by the current owner. Refer to Table 5a for a summary of air results at this residence.

65 North Road

This residence has a full basement that is constructed of poured concrete walls and floor. The house is heated with a forced hot air furnace. Egress to the basement is achieved through a bulkhead, no windows were observed in the basement area.

No COCs were detected in basement air during June 1999 and March 2000 sampling events. However, a PCE air concentration of $12 \mu\text{g}/\text{m}^3$ was detected in the basement during the August 8, 2000 sampling event. Subsequent sampling of this residence in November 2000, January 2001, March 2001, and October 2001 indicates that PCE concentrations in basement air have remained relatively constant, at or just above the BAIA PCE value of $11 \mu\text{g}/\text{m}^3$, throughout all sampling events. (Refer to Table 5b for a summary of air results.)

Minor fluctuations of reported indoor air quality are likely the result of seasonal variations, such as open windows, or use of the furnace. However, a decreasing concentration gradient from basement to 1st floor to 2nd floor has consistently been reported at this residence. A decreasing concentration from the basement to the 1st floor suggests that the detected indoor air concentration of PCE may be the result of groundwater contamination. However, it is also noted that numerous small containers of wood glue, paint, stain and solvent have been observed in the basement at this residence.

93 North Road

This residence has a full basement that is constructed of poured concrete walls and floor. The entire basement is finished as a living space. The house is heated with electricity. Numerous windows are located in the basement.

A PCE concentration of $49 \mu\text{g}/\text{m}^3$ was reported in basement air during the August 2000 sampling event. Subsequent sampling of basement air in November 2000, January 2001 and March 2001 reported PCE concentrations of $10 \mu\text{g}/\text{m}^3$, $6 \mu\text{g}/\text{m}^3$, and $5.2 \mu\text{g}/\text{m}^3$ (ND in the duplicate), respectively. No PCE or other COCs were reported in 1st floor living space. PCE concentrations in indoor air have decreased from a high of $49 \mu\text{g}/\text{m}^3$ in November 2000 to just above detection limits in March 2001. Refer to Table 5c for a summary of air results for this residence.

7. POTENTIAL SOURCES OF PCE/TCE GROUNDWATER CONTAMINATION

Locations of potential sources of the PCE and TCE groundwater contamination were determined by a review of MA DEP records, interviews with local residents and Town officials, and review of Town of Harwich and Dennis Boards of Health and Tax Assessors' records. Locations of these potential sources are shown on Figure 5. Properties with potential historic uses of PCE within the study area are identified below:

- **Dennisport Coin Operated Laundry, 13 Hall Street, Dennis, MA**
 - Located at southwestern/upgradient limit of main plume body (as defined by 1999-2000 data).
 - Former dry cleaning operations (1964-1997)
 - Former on-site storage of PCE (225-gallon AST and 55-gallon drums)
 - Discharge of gray water to combination of cesspools, leach pit, open pits
 - Reported groundwater contamination on northeast corner of property ($17,000 \mu\text{g}/\text{L}$ PCE in shallow groundwater in 1997 and $33,000 \mu\text{g}/\text{L}$ PCE at 25 fbg in 1998).
- **Brook's Pharmacy, corner of Division Street and Rte 28, Dennis, MA**
 - Located near the upgradient limit of main plume body (as defined by 1999-2000 data)
 - Location of former dry cleaner (personal communication 2001, Agent, Ms. Paula Champagne, and Harwich Fire Chief, Mr. Robert Peterson)
- **West Harwich Professional Building, 72 Main Street, Harwich, MA**
 - Located near the corner of Mansion Street and Rte 28, adjacent to Pinewood Village
 - Located mid-plume (as defined by 1999-2000 data)
 - Former dry cleaning operations (Key 1998) and Fire Chief Peterson (personal communication 2001).

Dowd's Cleaners, which was formerly located at the property now occupied by Aubuchon Hardware was identified as a potential source of PCE and TCE at the onset of this investigation. However, no dry cleaning operations have been reported at this location, and it has been reported the former laundromat activities occurred on the northeastern portion of this property, which is crossgradient of the observed groundwater plume.

8. FINDINGS

Based on the field screening and fixed-based laboratory results obtained during the investigations conducted under the SARSS contract and historic groundwater quality data collected by others (Key Environmental 1998; K-V Associates 1997 and 1998; DEP 1997), the highest concentrations of PCE and TCE that have been detected in groundwater in the study area, were at the Dennisport Coin Operated Laundry located at 13 Hall Street, Dennisport, MA (RTN 4-12832) (Samples collected by K-V Associates in 1997 reportedly contained PCE at 17,000 µg/L and TCE at 890 µg/L in shallow groundwater (0-11 fbg) in the northeast corner of the property. Samples collected in 1998 by K-V Associates from the same area at a depth of 25-30 feet contained PCE at 33,000 µg/L and TCE at 4,100 µg/L). Given the relatively shallow depth of this contamination and northeasterly direction of groundwater flow and decreasing PCE and TCE concentrations downgradient of this site, it appears that former dry cleaning operations and disposal practices may be a source of PCE/TCE groundwater contamination in the study area.

Subsurface investigation activities conducted in 1999-2000 and 2001 indicate that the body of the dissolved plume appears to have migrated to the northeast. A comparison of 1999-2000 data to the 2001 data indicates that PCE/TCE groundwater concentrations have decreased at SAIC-HD-107/-126 and SAIC-HD-104/125. However, PCE/TCE concentrations in the groundwater have remained constant at SAIC-HD-122/127 located slightly south of the main body of the plume. No VOCs were detected in shallow groundwater adjacent to the Herring River; however, in 1999, PCE and TCE were detected in intermediate depth groundwater along North Road. These concentrations were below the MCP Method 1 GW-3 Standards.

With the exception of irrigation wells reportedly located along North Road and on Smith Street (refer to Figure 7), active pumping of groundwater no longer exists along North Road or at Pinewood Village and it appears the primary discharge point for groundwater in the study area is the Herring River estuary system.

Indoor air sampling was conducted at a total of 15 locations in the study area. Detectable concentrations of PCE were identified at three residences located along North Road (61, 65 and 93 North Road), thereby suggesting that a Critical Exposure Pathway (CEP) as defined in 310 CMR 40.0006 (page 1478) may exist at these locations.

Only at 65 North Street was PCE detected in an air sample collected from the first floor (living space area). At 65 North Road, PCE was detected in an air sample from the first floor during three of the four sampling events; however, none of the first floor samples at 65 North Road contained PCE above the BAIA value of 11 µg/m³ and the most recent sample from this location showed no detectable concentrations of PCE.

9. RECOMMENDATIONS

It is recommended that in-plume microwells within the study area (SAIC-HD-124, -125, -126, -127, -128, -129, -130, -132, -137) be monitored for future migration of the dissolved PCE/TCE groundwater plume. In addition, wells installed along North Road (SAIC-HD-101, -102, -112, -131, -133, -134, -135, -and 136) should be monitored for potential changes in groundwater

quality. Air quality monitoring of residences along North Road (61, 65 and 93 North Road) should continue on a quarterly basis. Additional indoor air sampling should be conducted at residences located along North Road as appropriate based on results of groundwater quality data obtained during future groundwater sampling events to evaluate the potential for CEP conditions to exist.

Groundwater monitoring wells screened approximately 30-50 feet below grade should be installed along southern portions of Belmont Road and Silver Street to detect potential eastern migration of the dissolved groundwater plume.

10. REFERENCES

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TABLE 1
GROUNDWATER ELEVATIONS (May 2000 and October 2001)
WATER TABLE WELLS
PCE/TCE Study Area
Harwich, MA

Location	Elevation (TOC) ¹	Depth to Water ² (5/17/00)	Groundwater Elevation (5/17/00)	Depth to Water 10/23/2001	Groundwater Elevation (10/23/01)
SAIC-MW-01	10.52	8.04	2.48	8.72	1.80
SAIC-MW-02	12.67	8.14	4.53	* ³	*
SAIC-MW-03	18.6	12.71	5.89	14.15	4.45
SAIC-MW-04	14.25	7.05	7.20	8.87	5.38
SAIC-MW-05	15.13	9.05	6.08	10.72	4.41
SAIC-HD-118 W	11.37	5.93	5.44	- ⁴	-
SAIC-HD-119 W	8.54	4.1	4.44	5.10	3.44
SAIC-HD-120 W	17.09	-	-	-	-
SAIC-HD-123 W	21.56	17.45	4.11	18.70	2.86
SAIC-HD-129 W	8.77	NS ⁵	NS	5.61	3.16
SAIC-HD-131	5.13	NS	NS	3.26	1.87
SAIC-HD-133 W	9.21	NS	NS	7.14	2.07
SAIC-HD-134	6.39	NS	NS	4.05	2.34
SAIC-HD-135	7.55	NS	NS	5.38	2.17
SAIC-HD-136	7.42	NS	NS	5.81	1.61
PV-MW-2	15.31	NS	NS	12.29	3.02
PV-MW-4	18.24	NS	NS	15.00	3.24
PV-MW-5	16.08	NS	NS	12.90	3.18

Notes:

1. Elevations referenced to NGVD 29
2. All depth measurements relative to top of well casing.
3. (*) = Well Destroyed by snow plow.
4. (-) = Not Gauged. Well not gauged due to obstructions within well.
5. NS = Well did not exist or available at time of well gauging event.

TABLE 2
Groundwater Analytical Results (1999 and 2000)
Harwich, MA

				Field GC (MyKro Waters, Inc.)						Fixed-Base Laboratory (Toxikon, Inc.)											
Well No.	Location	Sample Number	Depth Interval	TCE (ppb)	PCE (ppb)	cis 1,2 DCE (ppb)	trans 1,2 DCE (ppb)	Toluene (ppb)	Benzene (ppb)	cis-1,2 DCE (ppb)	TCE (ppb)	PCE (ppb)	1,2 Dichlorobenzene (ppb)	1,1,2 Trichloroethane (ppb)	Toluene (ppb)	1,3-Dichlorobenzene (ppb)	1,4-Dichlorobenzene (ppb)	Benzene (ppb)	1,2-Dichloroethane (ppb)	MTBE (ppb)	Chlorobenzene (ppb)
MCP Method 1 Groundwater Standards										GW1=70 ppb GW2=30000 ppb GW3=50000 ppb	GW1= 5 ppb GW2= 300 ppb GW3=20000 ppb	GW1= 5 ppb GW2= 3000 ppb GW3=5000 ppb	GW1= 600 ppb GW2= 8,000 ppb GW3=8000 ppb	GW1= 5 ppb GW2= 20,000 ppb GW3=50000 ppb	GW1=1,000 ppb GW2= 6,000 ppb GW3=50000 ppb	GW1=600 ppb GW2=10000ppb GW3=8000 ppb	GW1=5 ppb GW2=30000ppb GW3=8000 ppb	GW1=5 ppb GW2=2000ppb GW3= 7000 ppb	GW1= 5 ppb GW2= 20 ppb GW3=50000 ppb	GW1 = 70ppb GW2=50000 ppb GW3=50000 ppb	GW1= 100 ppb GW2= 1,000 ppb GW3=500 ppb
101	Roadway in front of 61 North Rd. (Installed 5/28/99)	SAICHD101A	0-10	NT	BDL	NT	NT	NT	NT	1200	470	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD101B	10.0-20	NT	BDL	NT	NT	NT	NT												
		SAICHD101C	20-30	NT	230.0	NT	NT	NT	NT												
		SAICHD101D	30-40	NT	500.0	NT	NT	NT	NT	39	79	570	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD101E	40-50	NT	95.0	NT	NT	NT	NT												
		SAICHD101E	duplicate	NT	92.0	NT	NT	NT	NT												
		SAICHD101F	50-60	NT	Trace	NT	NT	NT	NT												
101	Roadway in front of 61 North Rd. (Installed 6/1/99)	SAICHD101A	0-10	360.0	Trace	NT	NT	NT	NT												
		SAICHD101B	10.0-20	23.0	Trace	NT	NT	NT	NT												
		SAICHD101C	20-30	21.0	190.0	NT	NT	NT	NT												
		SAICHD101D	30-40	71.0	600.0	NT	NT	NT	NT												
		SAICHD101E	40-50	48.0	97.0	NT	NT	NT	NT												
		SAICHD101F	50-60	Trace	Trace	NT	NT	NT	NT												
102	Roadway in front of 48 North Rd. (Installed 6/1/99)	SAICHD102A	0-10	BDL	BDL	NT	NT	NT	NT												
		SAICHD102B	10.0-20	BDL	BDL	NT	NT	NT	NT												
		SAICHD102C	20-30	BDL	BDL	NT	NT	NT	NT												
		SAICHD102D	30-40	Trace	6.0	NT	NT	NT	NT	ND	ND	7.7	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD102E	40-50	17.0	16.0	NT	NT	NT	NT	18	20	17	ND	ND	ND	ND	ND	ND	ND	ND	7
		SAICHD102E	duplicate	17.0	16.0	NT	NT	NT	NT												
		SAICHD102F	44-54	3.0	Trace	NT	NT	NT	NT												
103	Roadway b'twn 19 & 25 Mansion St. (Installed 6/1/99)	SAICHD103A	0-10	BDL	BDL	NT	NT	NT	NT												
		SAICHD103B	10.0-20	Trace	3.0	NT	NT	NT	NT												
		SAICHD103C	20-30	Trace	5.0	NT	NT	NT	NT												
		SAICHD103D	30-40	BDL	BDL	NT	NT	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD103E	40-50	7.0	74.0	NT	NT	NT	NT	9.7	7.3	67	11	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD103F	47-57	Trace	8.0	NT	NT	NT	NT												
104	Roadway across from 113 Division (Installed 6/2/99)	SAICHD104A	0-10	BDL	Trace	NT	NT	NT	NT												
		SAICHD104B	10.0-20	86.0	310.0	NT	NT	NT	NT												
		SAICHD104C	20-30	210.0	1100.0	NT	NT	NT	NT												
		SAICHD104D	30-40	270.0	1200.0	NT	NT	NT	NT	230	74	1100	ND	48	ND	ND	ND	ND	ND	ND	ND
		SAICHD104E	40-50	210.0	920.0	NT	NT	NT	NT												
		SAICHD104E	duplicate	260.0	1300.0	NT	NT	NT	NT												
		SAICHD104F	50-60	84.0	391.0	NT	NT	NT	NT												
		SAICHD104G	60-70	72.0	760.0	NT	NT	NT	NT	ND	ND	540	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD104H	70-80	5.0	59.0	NT	NT	NT	NT												
105	Roadway in front of Playground near 13 Hall Street (Installed 6/2/99)	SAICHD105A	10.0-20	BDL	BDL	NT	NT	NT	NT												
		SAICHD105B	20-30	BDL	BDL	NT	NT	NT	NT												
		SAICHD105C	30-40	BDL	BDL	NT	NT	NT	NT												
		SAICHD105D	40-50	Trace	BDL	NT	NT	NT	NT												
		SAICHD105E	50-60	10.0	160.0	NT	NT	NT	NT												
		SAICHD105F	60-70	4.0	65.0	NT	NT	NT	NT												
		SAICHD105G	70-80	Trace	14.0	NT	NT	NT	NT												
106	Pkng. Lot next to 691A Main St. (Installed 6/3/99)	SAICHD106A	0-10	BDL	BDL	NT	NT	NT	NT												
		SAICHD106B	10.0-20	8.0	33.0	NT	NT	NT	NT												
		SAICHD106C	20-30	53.0	190.0	NT	NT	NT	NT												
		SAICHD106D	30-40	63.0	200.0	NT	NT	NT	NT												
		SAICHD106E	40-50	80.0	160.0	NT	NT	NT	NT	120	47	170	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD106F	50-60	49.0	920.0	NT	NT	NT	NT	ND	ND	890	ND	ND	ND	ND	ND	ND	ND	ND	ND
107	Sidewalk in front of Aubuchon () (Installed 6/4/99)	SAICHD107A	11.0-21	BDL	BDL	NT	NT	NT	NT												
		SAICHD107B	22-32	Trace	Trace	NT	NT	NT	NT												
		SAICHD107C	33-43	300.0	2800.0	NT	NT	NT	NT												
		SAICHD107C	duplicate	380.0	3600.0	NT	NT	NT	NT												
		SAICHD107D	44-54	780.0	4900.0	NT	NT	NT	NT	880	830	5700	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD107E	54-64	110.0	4800.0	NT	NT	NT	NT												
		SAICHD107F	64-74	75.0	2300.0	NT	NT	NT	NT	23	70	2100	6.6	ND	ND	ND	ND	ND	ND	ND	6.2
108	Depot Street near Bells Neck Rd. (Installed 6/4/99)	SAICHD108A	10.0-20	BDL	BDL	NT	NT	NT	NT												
		SAICHD108B	20-30	BDL	BDL	NT	NT	NT	NT												
		SAICHD108C	30-40	BDL	5.0	NT	NT	NT	NT												
		SAICHD108D	40-50	64.0	240.0	NT	NT	NT	NT												
		SAICHD108E	50-60	150.0	670.0	NT	NT	NT	NT	120	120	690	99	ND	ND	ND	ND	ND	ND	ND	12
		SAICHD108F	50-60	2.0	18.0	NT	NT	NT	NT												

Notes: NT = Not Tested.
ND = Not Detected.

TABLE 2
Groundwater Analytical Results (1999 and 2000)
Harwich, MA

				Field GC (MyKro Waters, Inc.)						Fixed-Base Laboratory (Toxikon, Inc.)											
Well No.	Location	Sample Number	Depth Interval	TCE (ppb)	PCE (ppb)	cis 1,2 DCE (ppb)	trans1,2 DCE (ppb)	Toluene (ppb)	Benzene (ppb)	cis-1,2 DCE (ppb)	TCE (ppb)	PCE (ppb)	1,2 Dichlorobenzene (ppb)	1,1,2 Trichloroethane (ppb)	Toluene (ppb)	1,3-Dichlorobenzene (ppb)	1,4-Dichlorobenzene (ppb)	Benzene (ppb)	1,2-Dichloroethane (ppb)	MTBE (ppb)	Chlorobenzene (ppb)
MCP Method 1 Groundwater Standards										GW1=70 ppb GW2=30000 ppb GW3=50000 ppb	GW1= 5 ppb GW2= 300 ppb GW3=20000 ppb	GW1= 5 ppb GW2= 3000 ppb GW3=5000 ppb	GW1= 600 ppb GW2= 8,000 ppb GW3=8000 ppb	GW1= 5 ppb GW2= 20,000 ppb GW3=50000 ppb	GW1=1,000 ppb GW2= 6,000 ppb GW3=50000 ppb	GW1=600 ppb GW2=10000ppb GW3=8000 ppb	GW1=5 ppb GW2=30000ppb GW3=8000 ppb	GW1=5 ppb GW2=2000ppb GW3= 7000 ppb	GW1= 5 ppb GW2= 20 ppb GW3=50000 ppb	GW1 = 70ppb GW2=50000 ppb GW3=50000 ppb	GW1= 100 ppb GW2= 1,000 ppb GW3=500 ppb
		SAICHD108G	50-60	BDL	BDL	NT	NT	NT	NT												
109	Intersection Telegraph & U. County (Installed 6/7/99)	SAICHD109A	0-10	BDL	BDL	NT	NT	NT	NT												
		SAICHD109B	10.0-20	BDL	BDL	NT	NT	NT	NT												
		SAICHD109C	20-30	BDL	BDL	NT	NT	NT	NT												
		SAICHD109D	30-40	BDL	BDL	NT	NT	NT	NT												
		SAICHD109E	40-50	BDL	BDL	NT	NT	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD109F	50-60	BDL	BDL	NT	NT	NT	NT												
		SAICHD109F	duplicate	BDL	BDL	NT	NT	NT	NT												
		SAICHD109G	60-70	BDL	BDL	NT	NT	NT	NT												
110	Roadway in front of 10-18 South Street (Installed 6/7/99)	SAICHD110A	10.0-20	BDL	BDL	NT	NT	NT	NT												
		SAICHD110B	20-30	BDL	BDL	NT	NT	NT	NT												
		SAICHD110C	30-40	BDL	BDL	NT	NT	NT	NT												
		SAICHD110D	40-50	BDL	BDL	NT	NT	NT	NT												
		SAICHD110E	50-60	BDL	BDL	NT	NT	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD110F	60-70	BDL	BDL	NT	NT	NT	NT												
111	Roadway in front of 42 Smalls St. (Installed 6/8/99)	SAICHD111A	0-10	BDL	BDL	NT	NT	NT	NT												
		SAICHD111B	10.0-20	BDL	BDL	NT	NT	NT	NT												
		SAICHD111C	20-30	BDL	BDL	NT	NT	NT	NT												
		SAICHD111D	30-40	BDL	BDL	NT	NT	NT	NT												
		SAICHD111E	40-50	BDL	BDL	NT	NT	NT	NT												
		SAICHD111F	50-60	BDL	BDL	NT	NT	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD111G	60-70	BDL	BDL	NT	NT	NT	NT												
	Trip Blanks	5/18/99				NT	NT	NT	NT	ND	ND	ND	ND	ND	8	ND	ND	ND	ND	ND	ND
		SAICHD1B01		ND	BDL	NT	NT	NT	NT												
		SAICHD1B03		BDL	BDL	NT	NT	NT	NT												
		SAICHD1B04		BDL	BDL	NT	NT	NT	NT												
		SAICHD1B05				NT	NT	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD1B06		BDL	BDL	NT	NT	NT	NT												
		SAICHD1B07		BDL	BDL	NT	NT	NT	NT												
	Residence Sampling																				
	61 North Road	SAICHDGRAHAMWELL								36	110	1100	ND	ND	ND	ND	ND	ND	ND	ND	ND
	(outdoor spigot)	SAICHD1B09								ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	6/15/99																				
112	In front of 93 North Road (Installed 5/1/00)	SAICHD112A	0-10	ND	ND	ND	ND	ND	ND												
		SAICHD112B	10.0-20	ND	ND	ND	ND	ND	ND												
		SAICHD112C	20-30	ND	ND	ND	ND	ND	ND												
		SAICHD112D	30-40	72.0	1100.0	33.0	ND	ND	ND	ND	52	1600	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD112E	40-50	5.0	85.0	3.3	ND	ND	ND												
		SAICHD112F	50-60	Trace	6.8	Trace	ND	ND	ND												
		SAICHD112G	60-70	Trace	20.0	ND	ND	ND	ND												
		HD112G-Dup	60-70	Trace	18.0	ND	ND	ND	ND												
113	Henry Dunn Circle (Installed 5/1/00)	SAICHD113A	10.0-20	ND	ND	ND	ND	ND	ND												
		SAICHD113B	20-30	ND	ND	ND	ND	ND	ND												
		SAICHD113C	30-40	ND	ND	ND	ND	ND	ND												
		SAICHD113D	40-50	24.0	130.0	28.0	ND	ND	ND	17	15	93	13	ND	ND	6	10	ND	ND	ND	11
		SAICHD113E	50-60	3.5	7.5	3.8	ND	ND	ND												
		SAICHD113E	duplicate	2.2	5.7	1.9	ND	ND	ND												
114	In front of 62/64 Smith Street (Installed 5/2/00)	SAICHD114A	0-10	ND	ND	ND	ND	ND	ND												
		SAICHD114B	10.0-20	ND	ND	ND	ND	ND	ND												
		SAICHD114C	20-30	3.7	9.3	5.0	ND	ND	ND												
		SAICHD114D	30-40	ND	9.2	Trace	ND	ND	ND												
		SAICHD114E	40-50	7.5	33.0	3.7	Trace	ND	ND	ND	8	54	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD114E	duplicate	10.0	48.0	4.3	Trace	ND	ND												
		SAICHD114F	45-55	1.6	5.4	Trace	ND	ND	ND												
115	In front of 30 Smith Street (Installed 5/2/00)	SAICHD115A	0-10	ND	ND	ND	ND	ND	ND												
		SAICHD115B	10.0-20	ND	ND	ND	ND	ND	ND												
		SAICHD115C	20-30	ND	ND	ND	ND	ND	ND												
		SAICHD115D	30-40	3.1	6.1	9.1	ND	ND	ND												
		SAICHD115E	40-50	64.0	470.0	87.0	ND	ND	ND	110	85	420	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD115E	duplicate	45.0	290.0	72.0	ND	ND	ND												

Notes: NT = Not Tested.
ND = Not Detected.

TABLE 2
Groundwater Analytical Results (1999 and 2000)
Harwich, MA

				Field GC (MyKroWaters, Inc.)						Fixed-Base Laboratory (Toxikon, Inc.)											
Well No.	Location	Sample Number	Depth Interval	TCE (ppb)	PCE (ppb)	cis 1,2 DCE (ppb)	trans1,2 DCE (ppb)	Toluene (ppb)	Benzene (ppb)	cis-1,2 DCE (ppb)	TCE (ppb)	PCE (ppb)	1,2 Dichlorobenzene (ppb)	1,1,2 Trichloroethane (ppb)	Toluene (ppb)	1,3-Dichlorobenzene (ppb)	1,4-Dichlorobenzene (ppb)	Benzene (ppb)	1,2-Dichloroethane (ppb)	MTBE (ppb)	Chlorobenzene (ppb)
MCP Method 1 Groundwater Standards										GW1=70 ppb GW2=30000 ppb GW3=50000 ppb											
		SAICHD115F	50-60	1.2	9.4	1.6	ND	ND	ND												
		SAICHD115F	duplicate	1.4	13.0	1.5	ND	ND	ND												
		SAICHD115G	54-64	1.0	1.4	Trace	ND	ND	ND												
116	Pine Grove Rd. in front of Cemetery (Installed 5/3/00)	SAICHD116A	10.0-20	ND	ND	ND	ND	ND	ND												
		SAICHD116B	20-30	ND	Trace	Trace	ND	ND	ND												
		SAICHD116C	30-40	ND	Trace	ND	ND	ND	Trace												
		SAICHD116D	40-50	2.8	36.0	3.8	ND	ND	ND	Trace	6	5	71	ND	ND	ND	ND	ND	ND	200	ND
		SAICHD116D	duplicate	2.4	30.0	4.1	ND	ND	Trace	6	6	83	ND	ND	ND	ND	ND	ND	190	ND	
		SAICHD116E	50-60	1.0	6.5	Trace	ND	ND	Trace												
117*	Wayside Rd. Behind Aubuchon (Installed 5/3/00)	SAICHD117A	0-10	ND	ND	ND	ND	ND	ND												
		SAICHD117B	10.0-20	ND	ND	ND	ND	ND	ND												
		SAICHD117C	20-30	Trace	Trace	ND	ND	ND	ND												
		SAICHD117D	30-40	16.0	11.0	170.0	Not Calc.	ND	ND	16	ND	ND	ND	ND	ND	ND	ND	ND	ND	120	ND
		SAICHD117D	lab duplicate	29.0	15.0	200.0	23.0	ND	ND												
		SAICHD117E	40-50	72.0	15.0	86.0	3.2	ND	ND												
		SAICHD117E	duplicate	41.0	6.2	68.0	ND	ND	ND												
		SAICHD117F	50-60	65.4	1000.0	97.0	19.0	ND	640.0	37	60	1400	ND	ND	ND	ND	ND	640	8	210	ND
		SAICHD117G	60-70	3.0	111.0	Trace	Trace	ND	27.0												
118*	End of Carol Lane (Installed 5/4/00)	SAICHD118A	0-10	ND	Trace	ND	ND	ND	ND												
		SAICHD118B	10.0-20	ND	Trace	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD118C	20-30	ND	ND	ND	ND	ND	ND												
		SAICHD118D	30-40	ND	ND	ND	ND	ND	4.8												
		SAICHD118E	40-50	BDL	3.3	ND	ND	ND	2.0												
		SAICHD118E	duplicate	BDL	8.6	ND	ND	ND	2.9												
		SAICHD118F	50-60	Trace	Trace	ND	ND	ND	4.2												
119*	Mansion near Rte. 28 (Installed 5/4/00)	SAICHD119A	0-10	ND	ND	ND	ND	ND	1.8												
		SAICHD119B	10.0-20	ND	ND	ND	ND	ND	1.2												
		SAICHD119C	20-30	ND	ND	ND	ND	ND	1.7												
		SAICHD119D	30-40	Trace	1.3	Trace	ND	ND	1.7												
		SAICHD119E	40-50	2.7	39.0	5.3	Trace	ND	1.3	6	ND	76	7	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD119E	duplicate	4.6	74.0	7.4	Trace	ND	2.1												
		SAICHD119F	50-60	Trace	9.6	ND	ND	ND	8.3												
120*	Willow Street near Silver (Installed 5/8/00)	SAICHD120A	10.0-20	ND	ND	ND	ND	ND	ND												
		SAICHD120B	20-30	ND	ND	ND	ND	ND	ND												
		SAICHD120C	30-40	7.5	2.3	4.6	ND	Trace	ND												
		SAICHD120D	40-50	5.7	1.5	13.6	ND	2.6	ND	23	12	ND	ND	ND	7	ND	ND	ND	13	ND	ND
		SAICHD120E	50-60	2.0	6.1	ND	ND	4.9	ND												
		SAICHD120E	duplicate	1.1	1.2	1.7	ND	6.5	ND												
121	Intersection Silver and Main St. (Installed 5/8/00)	SAICHD121A	10.0-20	ND	ND	ND	ND	17.7	ND												
		SAICHD121B	20-30	ND	ND	ND	ND	3.3	ND												
		SAICHD121C	30-40	ND	ND	ND	ND	ND	ND												
		SAICHD121D	40-50	3.7	24.0	14.0	ND	ND	ND	30	18	40	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD121D	duplicate	4.2	26.0	21.0	ND	ND	ND	32	18	39	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD121E	50-60	2.4	17.0	15.0	ND	ND	ND												
122	Intersection Belmont & Main Street (Installed 5/9/00)	SAICHD122A	0-10	ND	ND	ND	ND	12.0	ND												
		SAICHD122B	10.0-20	ND	ND	ND	ND	3.4	ND												
		SAICHD122C	20-30	ND	ND	ND	ND	ND	ND												
		SAICHD122D	30-40	ND	ND	ND	ND	ND	ND												
		SAICHD122E	40-50	1.1	4.2	2.3	ND	ND	ND												
		SAICHD122E	duplicate	1.3	4.2	2.3	ND	ND	ND												
		SAICHD122F	50-60	20.0	720.0	1.8	ND	ND	ND	ND	ND	1300	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD122G	60-70	16.0	690.0	2.1	ND	ND	ND	ND	ND	790	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD122H	70-80	1.0	72.0	ND	ND	ND	ND												
123*	In front of 80 Willow Street (Installed 5/9/00)	SAICHD123A	10.0-20	ND	ND	ND	ND	ND	ND												
		SAICHD123B	20-30	ND	ND	ND	ND	ND	ND												
		SAICHD123C	30-40	ND	ND	ND	ND	ND	ND												
		SAICHD123D	40-50	ND	ND	ND	ND	ND	ND												
		SAICHD123E	50-60	ND	ND	ND	ND	ND	ND												
		SAICHD123E	duplicate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		SAICHD123F	55-65	ND	ND	ND	ND	ND	ND												

Notes: NT = Not Tested.
ND = Not Detected.

TABLE 3
Location and Screened Intervals
of Microwells Installed 2001

Harwich PCE/TCE Study Area

Well No.	Location	Adjacent to existing SAIC well No.	Screen Interval (feet bgs)
SAIC-HD-124	Hall Street, next to Village Green (pole # 90/3)	SAIC-HD-105	50-60
SAIC-HD-125	Division St. across from 113 Division (Brooks Pharmacy)	SAIC-HD-104	30-40
SAIC-HD-126	Rte. 28 in grass strip between road and sidewalk (Aubuchons)	SAIC-HD-107	44-54
SAIC-HD-127	Belmont Road (across from 198)	SAIC-HD-122	50-60
SAIC-HD-128	Depot Rd. (between Pole #s 50/3 and 50/4)	SAIC-HD-108	50-60
SAIC-HD-129	Across from 22 Smith Street (pole # 63/4)	SAIC-HD-115	40-50
SAIC-HD-129W			0-10
SAIC-HD-130	Henry Dunn Rd. (island in cul de sac)	SAIC-HD-113	40-50
SAIC-HD-131	Across from 65 North Rd.	SAIC-HD-101	0-10
SAIC-HD-132	Across from 93 North Rd.	SAIC-HD-112	0-10
SAIC-HD-133W	Across from 98 North Rd.	NA	0-10
SAIC-HD-133			30-40
SAIC-HD-134	1,500 ft stretch along	NA	0-10
SAIC-HD-135	North Road (causeway		0-10
SAIC-HD-136	portion across marshes)		0-10
SAIC-HD-137	Corner of 64 Smith Street	SAIC-HD-114	40-50

TABLE 4
Groundwater Analytical Results (ug/L)
Newly Installed or Sampled Wells
Harwich, MA
October, 2001

Well #	Depth Interval	Date	TCE (ppb)	PCE (ppb)	cis-dichloroethylene (ppb)	MTBE (ppb)	Chlorobenzene
GW-1			5	5	70	70	100
GW-2			300	3,000	30,000	50,000	500
GW-3			20,000	5,000	50,000	50,000	1,000
SAIC-HD-124	50-60	Oct-01	9.8	23	2.6	nd	nd
SAIC-HD-125	30-40	Oct-01	2.7	31	2.8	nd	nd
SAIC-HD-126	44-54	Oct-01	64	830	72	nd	nd
SAIC-HD-127	50-60	Oct-01	100	1200	4.6	nd	nd
SAIC-HD-128	50-60	Oct-01	60	420	57	nd	5.7
SAIC-HD-129	40-50	Oct-01	35	450	22	450	nd
SAIC-HD-130	40-50	Oct-01	6.9	54	5.5	nd	6.2
SAIC-HD-131	0-10	Oct-01	3.5	nd	34	nd	nd
SAIC-HD-131 (dup)	0-10	Oct-01	4.1	1.1	45	nd	nd
SAIC-HD-132	0-10	Oct-01	nd	nd	nd	nd	nd
SAIC-HD-133	30-40	Oct-01	nd	nd	nd	nd	nd
SAIC-HD-133 W	0-10	Oct-01	nd	nd	nd	nd	nd
SAI-HD-134	0-10	Oct-01	nd	nd	nd	nd	nd
SAIC-HD-135	0-10	Oct-01	nd	nd	nd	nd	nd
SAIC-HD-136	0-10	Oct-01	nd	nd	nd	nd	nd
SAIC-HD-137	40-50	Oct-01	12	72	7.8	nd	2.2
SAIC-HD-137 (dup)	40-50	Oct-01	13	73	9.1	nd	2.1
PV-MW-1	40-50	Oct-01	nd	1.4	nd	nd	nd
PV-MW-2	5-15	Oct-01	nd	nd	nd	nd	nd
PV-MW-4	5-15	Oct-01	nd	nd	nd	nd	nd
PV-MW-5	20-30	Oct-01	nd	nd	nd	nd	nd
Equip Rinse*		Oct-01	nd	nd	nd	nd	nd
Trip Blank		Oct-01	nd	nd	nd	nd	nd
Method Blank 101		Oct-01	nd	nd	nd	nd	nd
Method Blank 204			nd	nd	nd	nd	nd

Notes:

1. GW1/GW-2/GW-3 = MCP Method 1 Groundwater Standards.
2. SAIC wells are 0.6-inch micro-wells installed in October, 2001.
3. PV-MW wells are 2-inch monitoring wells installed by Key Environmental in September 2000 at Pinewood Village Property.
4. VOC analysis by EPA Method 8260 at fixed base laboratory. Refer to laboratory report for method detection limits and a complete list of analytes.
5. * = Acetone and Methylene Chloride reported in Equipment rinse sample at 9.2 ug/L and 1.5 ug/L (estimated) respectively.

TABLE 5
SUMMARY OF INDOOR AIR SAMPLING RESULTS
ALL LOCATIONS
(units: ug/m3)
Harwich PCE/TCE Site

	Background Ambient Indoor Air Guidance (ug/m3)	65 North Road	65 North Road	65 North (Basement)	65 North (Basement-center)	65 North (Living Room)	65 North -01 (basement-center)	65 North - 02 (1st floor den)	65 North -03 (living room)	65 North -04 (2nd floor)	65 North - 01 (NE corner-basement)	65 North - 02 (SE corner-basement)	65 North - 03 (1st floor - living room)	65 North (NE corner-basement)	65 North (Basement Dup)	65 North (1st floor -living room)	93 North (8/11/00 Basement sample)	93 North (Basement-center, under stairwell)	93 North (Living space - Living/Dining Area)	93 North - 01 (basement-center, under stairwell)**	93 North - 01 (duplicate)	93 North - 02 (living/dining area)	93 North -03 (2nd floor hallway)	93 North - 04 (basement - easterly side)	93 North - 01 (closet NW corner-basement)	93 North - 01 (Duplicate)	93 North - 02 (shelf, east side of basement)	93 North - 03 (1st floor - dining area)
EP Project No.: 100688		Jun-99	Mar-00	Aug-00	Nov-00	Jan-01				Mar-01			Oct-01			Aug-00	Nov-00		Jan-01					Mar-01				
Compound Detected																												
Acetone	6	14J	19	75	35	38	17	17	18	30	30	21	17	36	30	36	57	29	22	12	12	22	23	9.9	15	16	15	15
Ethanol	NL	26	110	59	46	860E	12	50	61	240	40	31	460	110	160	280	31	550	780E	46	47	980E	840E	62	490	510	500	510
Trichloroethene	5																											
Tetrachloroethene	11			12	17	7	15	6.2	6.5		11	12	5.4	7.5	7.3		49	10			6.0				5.2	ND	7.9	
Tetrahydrofuran	NL				20.0									4.2	3.4		13											
Xylenes	3			6.8	4.5	4.2					4.2	3.4					11.5	155.0	370.0	4		4.6	6.5				4.0	30.3
Toluene	29			7.3	6.7	17.0	6.2	9.0	8.4	8.9	5.2	5.5	6.5	4.7	8.8	5.4	18	65	140	4.9	5.3	12	18	4.9	5.4	4.7	6.4	26
4-Ethyltoluene	NL																	59.0	170.0									38
MTBE	NL																	59.0	120.0									1.5
Chloromethane	NL	2.6J		2.3				2.1			1.9	2.0	2.0	2.1	2.0	2.1	2.0		5.2	5.2	2.1		1.9	2.0	2.4	2.4		
Methylene Chloride	10	5.3JB		9.9 B	7.7	5.3	5.1	3.6	3.5	3.5	9.4	8.9	3.9	2.6	5.3	2.8						3.0	3.1					
Methyl Ethyl Ketone	42				34.0																							
Freon 12	NL			3.7	6.0	49.0											8.3	4.0	ND						9	9.4	9.2	4.6
Freon 11	NL				21.0												110	22	8.4	9.4	8.5	5.0	5.1	8.1				5.3
Benzene	21																4.7	6.2	12.0									
1,4-Dichlorobenzene	0.5																8.8											4.3
Ethylbenzene	10																	25.0	59.0									7.4
1,2,4-Trimethylbenzene	NL																6.3	66.0	200.0									
1,1,1-Trichloroethane	30																											
1,3,5-Trimethylbenzene	NL																	21.0	63.0									
Cyclohexane	NL																	11.0	22.0									7.7
2-Propanol	NL				17.0					19				38	16	64				13	12	66.0	62.0					26
Hexane	NL																	43.0	79.0									
styrene	5							3.2																				
1,4-dioxane	NL	43								16.0										14	15							

	Background Ambient Indoor Air Guidance (ug/m3)	63 North Road	63 North Road	63 North Road	11 Willow St. (basement)	11 Willow St. (Kitchen)	11 Willow St. (Kitchen-Dup)	20 North Road (basement)	20 North Road (Kitchen)	20 North	56 Smith Street	48 North Road	48 North Road (Dup)	72 Smith Street	22 Main	98 North Road	7 Main Street	102 North	61 North (basement-closet)	61 North (basement -closet)	61 North (basement-closet)	61 North (basement-living space)	61 North (1st Floor)	15 Bells Neck (basement)	54 Smith Street (Basement)	
Sampling Date:		Jun-99	Mar-00	Aug-00	May-00			May-00		Aug-00	Aug-00	Aug-00				Aug-00				Jun-99	Mar-00	Apr-00			Oct-01	
Compound Detected																										
Acetone	6	13		18	51	18	17	39	99	39	32	21	22	18		39	53	140	42	8.3					22	7.9
Ethanol	NL	9.3	52	22	18	21	21	570	1100E	84	39	7	5.9			11	7.9	41	56	52		14	70	18	6.6	
Trichloroethene	5																		15	25	8.6					
Tetrachloroethene	11																	25								
Tetrahydrofuran	NL															44		109	23.6J	3.9						
Xylenes	3									3.7	7.7		3.6			98		160	34	9.8						
Toluene	29							6.7	4.5	8.3		25.0	26			22		58								
4-Ethyltoluene	NL													9.4		62		130	110	28						
MTBE	NL															2.2	3.2					3.8	3.3			
Chloromethane	NL	2								2.3						12B			28B							
Methylene Chloride	10	5.9		3.5B						3.6B	28B	960B	1100EB	3.0B		11		30								
Methyl Ethyl Ketone	42										19.0					12		8.6								
Freon 12	NL			3.9						3.9	6.2	40.0	42	3.8		5.3	4.0	3.9	4.9J							
Freon 11	NL													2.7		12		8.6	11J				5.2			
Benzene	21							3.9								16		15	10J							
1,4-Dichlorobenzene	0.5															11		26	5.7J							
Ethylbenzene	10															36		50	5.8J							
1,2,4-Trimethylbenzene	NL															7.6										
1,1,1-Trichloroethane	30															8.5		18								
1,3,5-Trimethylbenzene	NL																									
Cyclohexane	NL																	22	16J							
2-Propanol	NL									20.0	13.0	12.0	12	20				27	16J							
Hexane	NL															27										
styrene	5																									
1,4-dioxane	NL					100	100																			

NOTES:
1. Bold = Exceeds MADEP Background Ambient Indoor Air Guidance (9/98)
2. All Samples collected over 24-hour period with 6-liter SUMA Cannisters
3. Only those compounds detected are listed. Refer to laboratory reports for a full list of parameters.
KEY:
NL= Not Listed
B=Present in lab blank
E=Exceeds instrument calibration range
J = Estimated value.

TABLE 5a
SUMMARY OF INDOOR AIR SAMPLING RESULTS
61 North Road
(units: ug/m3)

	Background Ambient Indoor Air Guidance (ug/m3)	61 North (basement- closet)	61 North (basement - closet)	61 North (basement- closet)	61 North (basement-living space)	61 North (1st Floor)
Sampling Date:		16-Jun-99	1-Mar-00	5-Apr-00		
Compound Detected						
Acetone	6	42	8			
Ethanol	NL	56	52		14	70
Trichloroethene	5					
Tetrachloroethene	11	15	25	8.6		
Tetrahydrofuran	NL					
Xylenes	3	23.6J	3.9			
Toluene	29	34	10			
4-Ethyltoluene	NL					
MTBE	NL	110.0	28.0			
Chloromethane	NL				3.8	3.3
Methylene Chloride	10	28B				
Methyl Ethyl Ketone	42					
Freon 12	NL	4.9J				
Freon 11	NL	11J				
Benzene	21	10J				5.2
1,4-Dichlorobenzene	0.5					
Ethylbenzene	10	5.7J				
1,2,4-Trimethylbenzene	NL	5.8J				
1,1,1-Trichloroethane	30					
1,3,5-Trimethylbenzene	NL					
Cyclohexane	NL					
2-Propanol	NL	16J				
Hexane	NL	16J				
styrene	5					
1,4-dioxane	NL					

NOTES:

1. Bold = Exceeds MADEP Background Ambient Indoor Air Guidance (9/98)
2. All Samples collected over 24-hour period with 6-liter SUMA Cannisters
3. Only those compounds detected are listed. Refer to laboratory reports for a full list of parameters.

KEY:

NL= Not Listed

B=Present in lab blank

E=Exceeds instrument calibration range

TABLE 5b
SUMMARY OF INDOOR AIR SAMPLING RESULTS
65 North Road
(units: ug/m3)

Harwich PCE/TCE Site

Sampling Date:	Compound Detected	Background Ambient Indoor Air Concentration (ug/m3)		65 North Road		65 North Road		11-Aug-00		27-Nov-00		3-Jan-01				2-Mar-01				10-Oct-01			
		16-Jun-1999	1-Mar-2000	65 North (Basement)	65 North (Living Room)	65 North-01 (Basement-center)	65 North-02 (1st floor den)	65 North-03 (living room)	65 North-04 (2nd floor)	65 North-01 (NE corner-Basement)	65 North-02 (SE corner-Basement)	65 North-03 (1st floor-living room)	65 North (NE corner-Basement)	65 North (Basement)	65 North (1st floor-living room)	65 North (Basement) (Hsp)	65 North (1st floor-living room)						
	Acetone	6	14J	19	75	35	38	17	17	18	30	30	21	17	36	30	36						
	Ethanol	NL	26	110	59	46	860E	12	50	61	240	40	31	460	110	160	280						
	Trichloroethene	5																					
	Tetrachloroethene	11			12	17	7	15	6	7		11	12	5.4	7.5	7.3							
	Tetrahydrofuran	NL				20.0						4.2	3.4										
	Xylenes	3			6.8	4.5	4.2					5.2	5.5	6.5	4.7	8.8	5.4						
	Toluene	29			7.3	6.7	17.0	6.2	9.0	8.4	8.9	5.2	5.5										
	4-Ethyltoluene	NL																					
	MTBE	NL																					
	Chloromethane	NL	2.6J		2.3																		
	Methylene Chloride	10	5.3JB		9.9B	7.7	5.3	5.1	3.6	3.5	3.5	1.9	2.0	2.0	2.1	2.0	2.1						
	Methyl Ethyl Ketone	47				34.0						9.4	8.9	3.9	2.6	5.3	2.8						
	Freon 12	NL			3.7	6.0	49.0																
	Freon 11	NL				21.0																	
	Benzene	21																					
	1,4-Dichlorobenzene	6.5																					
	Ethylbenzene	10																					
	1,2,4-Trimethylbenzene	NL																					
	1,1,1-Trichloroethane	30																					
	1,3,5-Trimethylbenzene	NL																					
	Cyclohexane	NL																					
	2-Propanol	NL																					
	Hexane	NL					17.0																
	styrene	5					17.0				18.0				38	16	64						
	1,4-dioxane	NL	43						3.2		16.0												

NOTES:
 1. Bold = Exceeds MADEP Background Ambient Indoor Air Guidance (9/98)
 2. All Samples collected over 24-hour period with 6-liter SUMMA Canisters
 3. Only those compounds detected are listed. Refer to laboratory reports for a full list of parameters.

KEY:

NL= Not Listed

B=Present in lab blank

E=Exceeds instrument calibration range

TABLE 5c
SUMMARY OF INDOOR AIR SAMPLING RESULTS
93 North Road
 (units: ug/m3)
Harwich PCE/TCE Site

Sampling Date:	Background Ambient Indoor Air Guidance (ug/m3)	93 North (8/11/00 Basement sample)	93 North (Basement- center, under stairwell)	93 North (Living space - Living/Dining Area)	93 North - 01 (basement- center, under stairwell)*	3-Jan-01			2-Mar-01			93 North - 03 (1st floor - dining area)	
						93 North - 01 (duplicate)	93 North - 02 (living/dining area)	93 North - 03 (2nd floor hallway)	93 North - 04 (basement - easterly side)	93 North - 01 (closet NW corner-basement)	93 North - 01 (Duplicate)		93 North - 02 (shelf, east side of basement)
Compound Detected		11-Aug-00	27-Nov-00										
Acetone	6	57	29	22	12	12	22	23	9.9	15	16	15	15
Ethanol	NL	31	550	780E	46	47	880E	840E	62	490	510	500	510
Trichloroethene	5												
Tetrachloroethene	11	49	10			6.0				5.2	ND	7.9	
Tetrahydrofuran	NL	13											
Xylenes	3	11.5	155.0	370.0	4.0*		4.6*	6.5*				4.0	30.3
Toluene	29	18	65	140	4.9	5.3	12	18	4.9	5.4	4.7	6.4	26
4-Ethyltoluene	NL		59.0	170.0									
MTBE	NL		59.0	120.0									
Chloromethane	NL	2.0			2.1		1.9	2.0		2.4	2.4		1.5
Methylene Chloride	10		5.2	5.2			3.0	3.1					
Methyl Ethyl Ketone	42												
Freon 12	NL	8.3	4.0	ND									
Freon 11	NL	110	22	8.4	9.4	8.5	5.0	5.1	8.1	9	9.4	9.2	4.6
Benzene	21	4.7	6.2	12.0									5.3
1,4-Dichlorobenzene	0.5	8.8											
Ethylbenzene	10		25.0	59.0									4.3
1,2,4-Trimethylbenzene	NL	6.3	66.0	200.0									7.4
1,1,1-Trichloroethane	30												
1,3,5-Trimethylbenzene	NL		21.0	63.0									
Cyclohexane	NL		11.0	22.0									
2-Propanol	NL				13	12	66.0	62.0					7.7
Hexane	NL		43.0	79.0									26
styrene	5												
1,4-dioxane	NL				14	15							

NOTES:

1. Bold = Exceeds MADEP Background Ambient Indoor Air Guidance (9/98)
2. All Samples collected over 24-hour period with 6-liter SUMA Cannisters
3. Only those compounds detected are listed. Refer to laboratory reports for a full list of parameters.

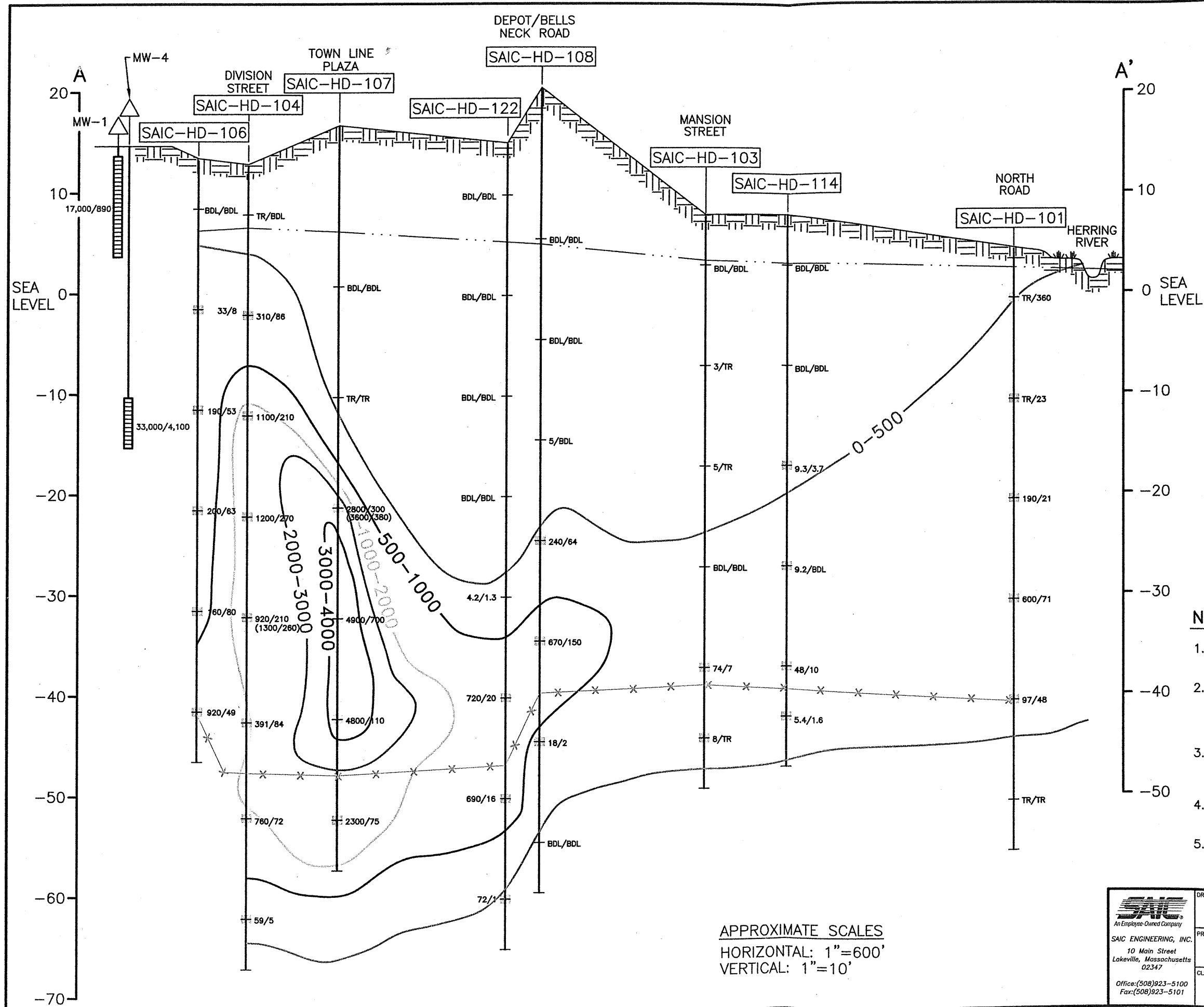
KEY:

NL= Not Listed
 B=Present in lab blank
 E=Exceeds instrument calibration range

WEST HARWICH WELL TESTING RESULTS 4-13326

LOCATION	SAMPLING DATE	CONTAMINANT	CONCENTRATION DETECTED	RCGW-1
Pinewood Condos Unit 3	8/18/97	p-Dichlorobenzene Trichloroethylene Vinyl Chloride cis-1,2 Dichloroethylene Tetrachloroethylene	11.0 ug/l 59.0 3.8 86.0 260.0	5.0 ug/l 5.0 2.0 70.0 5.0
Pinewood Condos Unit 3	8/28/97	p-Dichlorobenzene Trichloroethylene Vinyl Chloride cis-1,2 Dichloroethylene Tetrachloroethylene	9.5 52.0 3.2 78.0 230.0	5.0 5.0 2.0 70.0 5.0
Pinewood Condos Courtyard	8/28/97	p-Dichlorobenzene Trichloroethylene Vinyl Chloride cis-1,2 Dichloroethylene Tetrachloroethylene	9.8 54.0 3.6 80.0 250.0	5.0 5.0 2.0 70.0 5.0
Pinewood Condos Wellhead After	8/28/97	p-Dichlorobenzene Trichloroethylene Vinyl Chloride cis-1,2 Dichloroethylene Tetrachloroethylene	8.9 50.0 3.6 80.0 250.0	5.0 5.0 2.0 70.0 5.0
Pinewood Condos Wellhead Before	8/28/97	p-Dichlorobenzene Trichloroethylene Vinyl Chloride cis-1,2 Dichloroethylene Tetrachloroethylene	9.6 52.0 3.4 79.0 240.0	5.0 5.0 2.0 70.0 5.0
65 North Road Creighton private well	9/12/97	cis-1,2 Dichloroethene Trichloroethene Tetrachloroethene	110.0 260.0 5300.0	5.0 5.0 5.0
65 North Road Creighton private well	9/18/97	cis-1,2 Dichloroethene Trichloroethene Tetrachloroethene	81.0 190.0 3900.0	5.0 5.0 5.0
61 North Road Graham private well #1	9/15/97	cis-1,2 Dichloroethene Trichloroethene Tetrachloroethene	15.0 52.0 1300.0	5.0 5.0 5.0
61 North Road Graham private well #1	9/18/97	cis-1,2 Dichloroethene Trichloroethene Tetrachloroethene	20.0 64.0 960.0	5.0 5.0 5.0

LOCATION	SAMPLING DATE	CONTAMINANT	CONCENTRATION DETECTED	RCGW-1
61 North Road Graham private well #2	9/18/97	cis-1,2 Dichloroethene Trichloroethene Tetrachloroethene	32 ug/l 73 1100	5.0 ug/l 5.0 5.0
53 North Road Slincy irrigation well	9/18/97	cis-1,2 Dichloroethene Trichloroethene Tetrachloroethene	68 420 220	5.0 ug/l 5.0 5.0
Vacant Lot R-1 North Road observation well	9/18/97	Chloroform	0.7	5.0
95 North Road owner ? private well	9/18/97	Chloroform	12.0	5.0
98 North Road Breingan private well	9/12/97	Chloroform	2.7	5.0
98 North Road Breingan private well	9/18/97	Chloroform	2.6	5.0
20 North Road irrigation well	9/18/97	Chloroform	0.7	5.0
44 Smith Street McKenny irrigation well	9/15/97	Trichloroethene Tetrachloroethene	25 0.8	5.0 5.0
66 Route 28 Orleans Auto Supply private well	9/12/97	Tetrachloroethene	40	5.0
29 North Road Sweeney		?		
28 North Road Foster		ND - verbal only		
93 North Road Eldridge		ND - verbal only		



LEGEND

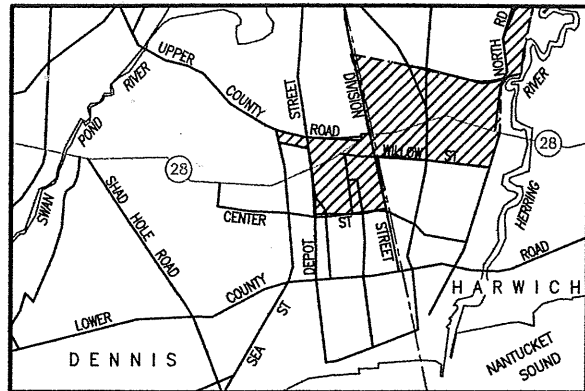
- · — · — WATER TABLE ELEVATIONS AS OBSERVED DURING DRILLING ACTIVITIES IN 1999
- x — x — x APPROXIMATE DEPTH OF TOP OF DENSE GREY/SILTY LAYER
- — — GROUND SURFACE
- — — SAMPLE DEPTH WITH TCE OR PCE AT CONCENTRATION EXCEEDING MCP RC GW-1 FIELD SCREENING RESULTS
- — — SAMPLE DEPTH WITH TCE OR PCE AT CONCENTRATION EXCEEDING MCP RC GW-1 AND RC GW-2 FIELD SCREENING RESULTS
- 17,000/890 LABOARATORY RESULTS FOR DENNISPORT COIN OPERATED LAUNDRY (K-V ASSOCIATES, 1997 & 1998) RTN-4-12832
- 240/64 PCE AND TCE CONCENTRATIONS RESPECTIVELY (IN ppb) BASED ON 1999 AND 2000 DATA
- BDL BELOW DETECTION LIMITS
- TR TRACE
- SAIC-HD-101 SAIC ID NUMBER
- △ 1998 PCE AND TCE CONCENTRATIONS REPORTED IN GROUNDWATER AT DENNISPORT COIN OPERATED LAUNDRY (K-V ASSOCIATES, 1998) MW-1 (1-11 FBG), MW-4 (25-30 FBG)
- 0-500 COMBINED 1999 AND 2000 PCE AND TCE CONCENTRATIONS (ppb) (PCE/TCE DATA FOR 1997 AND 1998 MW-1 AND MW-4 NOT INCLUDED IN ISOCONS)

NOTES:

- MCP RC GW-1 VALUES: TCE=5ppb, PCE=5ppb
MCP RC GW-2 VALUES: TCE=300ppb, PCE=3,000ppb
- PCE/TCE CONCENTRATIONS WERE OBTAINED DURING WELL INSTALLATION ACTIVITIES. CONCENTRATIONS SHOWN ARE FIELD GAS CHROMATOGRAPH READINGS.
- SUBSURFACE STRATIGRAPHY IS APPROXIMATED BASED ON FIELD OBSERVATIONS MADE DURING MICROWELL INSTALLATION (DIRECT-PUSH TECHNOLOGY).
- LOCATION OF CROSS SECTION A-A' IS SHOWN ON FIGURE 5.
- PCE/TCE CONCENTRATIONS REPORTED FOR MW-1 AND MW-4 ARE BASED ON INFORMATION PROVIDED IN 1997 AND 1998 REPORTS BY K-V ASSOCIATES, INC.

APPROXIMATE SCALES
HORIZONTAL: 1"=600'
VERTICAL: 1"=10'

<p>SAIC ENGINEERING, INC. 10 Main Street Lakeville, Massachusetts 02347 Office: (508) 923-5100 Fax: (508) 923-5101</p>	DRAWING TITLE	CROSS SECTION A-A' FIELD SCREENING RESULTS		SCALE	AS SHOWN	REV.:	DATE:
	PROJECT	HARWICH PCE/TCE SITE HARWICH/DENNIS, MA DEP PROJECT No. 100687		DATE	1-13-03	DESCRIPTION:	
	CLIENT	MASSACHUSETTS DEP SARSS IV CONTRACT EQEJ214		DRAWN BY	VAL	FIGURE NO.	3
				DESIGNED BY	MDH	PROJECT NO.	01-1504-00-0858-005
				CHECKED BY	MDH		
				APPROVED BY	PdG		



SITE LOCUS
SCALE: 1"=4000'



WATER TABLE WELLS GAUGED 5/17/00

WELL	NORTHING	EASTING	ELEV. ¹	ELEV. ²
SAIC-MW-01	10448.85	13554.47	10.91	10.52
SAIC-MW-02	11538.60	11623.14	13.06	12.67
SAIC-MW-03	9916.95	8806.91	18.95	18.60
SAIC-MW-04	8229.05	9903.96	14.59	14.25
SAIC-MW-05	8371.75	11312.77	15.39	15.13
SAIC-HD-118W	10818.54	10754.32	11.51	11.37
SAIC-HD-119W	10459.46	12681.54	8.82	8.54
SAIC-HD-120W	9539.63	11161.61	17.48	17.09
SAIC-HD-123W	9443.85	12973.63	21.76	21.56

ELEV.¹ = RIM OF WELL COVER FLUSH WITH GROUND (NGVD 29)


ELEV.² = TOP OF PVC MONITORING PIPE (ELEVATIONS SHOWN IN THIS COLUMN WERE CALCULATED BASED ON MEASUREMENTS INSIDE WELL FROM RIM OF WELL COVER TO TOP OF PVC MONITORING PIPE BY SAIC ENGINEERING, INC.)

LEGEND:

- MICROWELL LOCATIONS (INSTALLED 1999-2000)
- ◊ MICROWELL PAIR LOCATIONS (ie. WATER TABLE AND DEEP WELL PAIR) (INSTALLED 1999-2000)
- ◊ 2" DIAMETER MONITORING WELLS (INSTALLED MAY 2000)
- ▲ INDOOR AIR SAMPLING LOCATIONS
- ⊙ IN-PLUME MICROWELL LOCATIONS (INSTALLED 2001)
- ◊ SHALLOW MICROWELL LOCATIONS (INSTALLED 2001)
- ◊ MICROWELL PAIR LOCATIONS (ie. WATER TABLE AND DEEP WELL PAIR) (INSTALLED 2001)
- ⊕ APPROXIMATE LOCATION OF REPORTEDLY ACTIVE IRRIGATION WELLS (FROM HARWICH BOARD OF HEALTH)
- [2.48] WATER TABLE ELEVATION MEASURED ON 5/17/00 (FEET MSL)
- GROUNDWATER CONTOUR BASED ON MEASUREMENTS MADE 5/17/00 (FEET MSL) (DASHED WHERE INFERRED)
- - - DENNIS/HARWICH TOWN LINE
- APPROXIMATE LIMIT OF WETLANDS
- PROPERTIES EVALUATED AS POTENTIAL SOURCES

NOTES:

- 1) PROPERTY LINES AND STREET LINES SHOWN HEREON WERE SCALED FROM ASSESSOR'S MAPS AND ARE NOT BASED ON A FIELD SURVEY.
- 2) HORIZONTAL LOCATIONS OF MONITORING WELLS REPRESENT THE RESULTS OF FIELD SURVEYS AND ARE REFERENCED TO AN ASSUMED COORDINATE SYSTEM WHOSE AXES ARE NOT ORIENTED IN THE CARDINAL DIRECTIONS. THE COORDINATES GIVEN FOR EACH WELL ARE INTENDED TO REPRESENT ITS' LOCATION RELATIVE TO OTHER WELLS. COORDINATE SYSTEM ESTABLISHED BY BOUCHER & HEUREUX, INC.
- 3) PLAN DERIVED FROM A PLAN ENTITLED "EXHIBIT SHOWING MONITORING WELL LOCATIONS DENNIS & HARWICH, MASSACHUSETTS", DRAWN BY BOUCHER & HEUREUX, INC., DATED JUNE 1, 2000.
- 4) GROUNDWATER CONTOURS REPRESENT A SINGLE POINT IN TIME AND MAY VARY DUE TO CLIMATIC CHANGES OR OTHER FACTORS. GROUNDWATER CONTOURS ARE INTERPOLATED BETWEEN DATA POINTS AND INFERRED IN OTHER AREAS (DASHED WHERE INFERRED). GROUNDWATER CONTOURS ASSUME HOMOGENEOUS AND ISOTROPIC AQUIFER CONDITIONS AND HORIZONTAL FLOW. ACTUAL SUBSURFACE CONDITIONS MAY VARY FROM THOSE SHOWN OR INTERPOLATED.

 SAIC An Employee-Owned Company SAIC ENGINEERING, INC. 10 Main Street Lakeville, Massachusetts 02347 Office: (508) 923-5100 Fax: (508) 923-5101	DRAWING TITLE		SCALE	REV:	DATE:
	GROUNDWATER CONTOURS		1"=600'		
	5/17/00		DATE		
	3-17-03				
PROJECT	HARWICH PCE/TCE SITE HARWICH/DENNIS, MA DEP PROJECT No. 100687		DRAWN BY	VAL	
			DESIGNED BY	MDH	
CLIENT	MASSACHUSETTS DEP SARSS IV CONTRACT EQEJ217		CHECKED BY	MDH	
			APPROVED BY	AFD	
			FIGURE NO.	4	
			PROJECT NO.	01-1504-00-0858-005	
			FILE No.	HRWCHGWDWG	

40.0173: continued

- (b) the Department may issue to any person a Request for Information;
- (c) the Department may issue an order under M.G.L. c. 21E, •• 9 or 10, requiring any person to perform one or more response actions;
- (d) the Department may seek and execute an administrative inspection warrant or criminal search warrant in accordance with applicable law;
- (e) the Department may take or arrange the performance of any necessary response action in accordance with M.G.L. c. 21E and 310 CMR 40.0000;
- (f) the Department may issue a Notice of Responsibility to any person who is a PRP; and
- (g) the Department may deny the request or take any other action authorized by M.G.L. c. 21E, 310 CMR 40.0000 or any other law.

(4) In addition to the actions set forth in 310 CMR 40.0173(3), the Department may designate as its authorized representative for the purpose of access one or more RPs, PRPs or Other Persons, including employees, agents and contractors of such parties. The Department may exercise the authority contained in M.G.L. c. 21E, • 8, to obtain access for its designated representative. An RP, PRP or Other Person may only be designated as the Department's authorized representative if such person has agreed to serve as the Department's designated representative and to indemnify the Department to the Department's satisfaction for any injuries or damages that occur as a result of the activities undertaken by such person pursuant to such designation.

(5) The Department's decision in response to a request for Site Access Authorization under 310 CMR 40.0173 shall not be subject to M.G.L. c. 30A, or any other law, governing adjudicatory proceedings.

(6) The authority in 310 CMR 40.0173 is intended to be exercised at the Department's discretion. No provision in 310 CMR 40.0173 shall be construed to create in any person a right to the Department's authorization for access or to create any duty of the Department to obtain access to any site or other location for any person.

40.0180: Downgradient Property Status

310 CMR 40.0181 through 40.0189, cited collectively as 310 CMR 40.0180, sets forth the requirements and procedures for asserting and maintaining a Downgradient Property Status.

40.0181: Purpose

The purposes for enabling an owner or operator of property which comprises a portion of a disposal site and which is located downgradient of a property which is the source of the release of oil and/or hazardous material located thereon to establish Downgradient Property Status are:

- (1) to establish requirements, procedures and deadlines applicable to properties downgradient from a release of oil and/or hazardous material which comprise a portion of a disposal site;
- (2) to limit the assessment of annual compliance assurance fees under 310 CMR 4.00 while the activities required by 310 CMR 40.0185 are on-going; and
- (3) to facilitate access to properties which comprise a portion of a disposal site by persons undertaking response actions.

40.0182: Applicability

Any person who is liable or potentially liable under M.G.L. c. 21E, • 5(a)(1) or (2) for certain releases of oil and/or hazardous material on Downgradient Property, and who satisfies the requirements and procedures set forth in 310 CMR 40.0183 or 310 CMR 40.0187, may submit to the Department a Downgradient Property Status Submittal in accordance with 310 CMR 40.0183(3), or a Modification of a Downgradient Property Status Submittal in accordance with 310 CMR 40.0187(2).

40.0183: General Requirements and Procedures For Asserting Downgradient Property Status

(1) General. Any person who meets the requirements of, and complies with the procedures in, 310 CMR 40.0183 and 310 CMR 40.0185 shall have Downgradient Property Status for purposes of 310 CMR 40.0184, unless and until such Status is terminated in accordance with 310 CMR 40.0186.

(2) Criteria. Any present or past owner or operator of a downgradient or downstream property where a release of oil and/or hazardous material has come to be located may provide a Downgradient Property Status Submittal to the Department if all of the following are met:

(a) such person has notified the Department of the release if notification is required by 310 CMR 40.0300;

(b) the source of the release of oil and/or hazardous material at the downgradient or downstream property is or was located on one or more upgradient or upstream location(s) and oil and/or hazardous material from that location(s) has come to be located at the downgradient or downstream property as a result of migration of the oil and/or hazardous material in or on groundwater or surface water, regardless of whether the upgradient or upstream location(s) which is the source has been identified as the source of the release(s);

(c) no act of such person has contributed to the release described in 310 CMR 40.0183(2)(b), or caused such release to become worse than it otherwise would have been;

(d) such person is not, and was not at any time, affiliated with any other person (i) who owned or operated the property from which the release described in 310 CMR 40.0183(2)(b) originated, or caused such release, and (ii) who is potentially liable under M.G.L. c. 21E for the disposal site through any direct or indirect contractual, corporate or financial relationship other than:

1. that established by any instrument creating such person's interest in the downgradient property; or

2. that established by an instrument wholly unrelated to the disposal site and which would not otherwise render such person potentially liable as a result of the relationship; and

(e) to the extent such person has performed response actions at the disposal site, those response actions have been performed in compliance with the requirements and procedures in M.G.L. c. 21E and 310 CMR 40.0000.

(3) Content of Submittal. A Downgradient Property Status Submittal shall consist of the following:

(a) a completed transmittal form established by the Department for such purposes;

(b) a Downgradient Property Status Opinion prepared in accordance with 310 CMR 40.0015 and 310 CMR 40.0183(4);

(c) the certification required by 310 CMR 40.0009; and

(d) the fee, if applicable, required by 310 CMR 4.03.

(4) Performance Standard for a Downgradient Property Status Opinion. A Downgradient Property Status Opinion shall be based on investigative and assessment actions of sufficient scope and level of effort to conclude that the criteria in 310 CMR 40.0183(2)(b) have been met. The Opinion shall include an explanation and documentation of the technical basis for the conclusions stated therein, and be based on the following:

(a) an evaluation of the boundaries of the property which is the subject of the Opinion;

(b) an evaluation of the disposal site boundaries, to the extent they have been defined by assessments conducted to date;

(c) an evaluation of the releases of oil and/or hazardous material at the disposal site, to the extent that such releases have been identified;

(d) an evaluation of the relevant hydrogeologic conditions, including, at a minimum, groundwater flow direction and local transport characteristics based on field data, when migration of oil and/or hazardous material has occurred via groundwater;

(e) a plan showing the downgradient or downstream property and the disposal site boundaries (to the extent known), the locations of any known or suspected source(s) of oil and/or hazardous material(s) release(s) that have come to be located at the downgradient or downstream property, the direction of groundwater flow and/or surface water flow (as appropriate), the locations where samples were collected for analysis, and the results of the analyses; and

40.0183: continued

(f) an evaluation of the need to conduct an Immediate Response Action, as defined in 310 CMR 40.0412.

(5) Notice to Abutters and PRPs. Prior to, or concurrent with, providing the Downgradient Property Status Submittal to the Department, the person providing such Submittal shall provide a copy of the Downgradient Property Status Opinion to each of the following persons:

- (a) the owners and operators of abutting property upgradient and downgradient from the property which is the subject of the Submittal and, where the abutting upgradient and/or downgradient property is a public way, the owners and operators of the next upgradient and/or downgradient property; and
- (b) the owners and operators of any property which is a known or suspected source of the release.

(6) Public Involvement. Public Involvement Activities shall be conducted in accordance with 310 CMR 40.1400. Public Involvement Activities required for Downgradient Property Status specifically include 310 CMR 40.1403(3)(g).

40.0184: Effect of Providing a Downgradient Property Status Submittal or a Modification of a Downgradient Property Status Submittal

(1) Any person who establishes and maintains Downgradient Property Status in accordance with the requirements and procedures in 310 CMR 40.0180 shall not be subject to the subsequent deadlines for Tier Classification and Comprehensive Response Actions in 310 CMR 40.0500 and 40.0600, unless and until such Status is terminated in accordance with 310 CMR 40.0186.

(2) Upon receipt of a Downgradient Property Status Submittal or a Modification of a Downgradient Property Status Submittal filed in accordance with 310 CMR 40.0183 or 310 CMR 40.0187, respectively, the Department shall suspend the assessment of Tier I or Tier II annual compliance assurance fees, if applicable, on the person making such Submittal; provided, however, that payment of such fees shall be required for the billable year in which the Submittal is provided to the Department, except as provided in 310 CMR 4.03.

(3) The provision of a Downgradient Property Status Submittal, or a Modification of a Downgradient Property Status Submittal, to the Department shall not relieve any person from any prospective obligation to provide notification in accordance with 310 CMR 40.0300 or to perform Immediate Response Actions required by 310 CMR 40.0410. Any person providing a Downgradient Property Status Submittal, or a Modification of a Downgradient Property Status Submittal, to the Department may perform Release Abatement Measures in accordance with 310 CMR 40.0440, Utility-related Abatement Measures in accordance with 310 CMR 40.0460, and/or a Phase I - Initial Site Investigation Activities in accordance with 310 CMR 40.0480.

(4) The provision of a Downgradient Property Status Submittal, or a Modification of a Downgradient Property Status Submittal, to the Department shall not relieve any person from any obligation for the cost of response actions related to the disposal site for which that person is legally responsible or in any way affect any legal or equitable right of the Department to issue any future order with respect to the disposal site that is the subject of the Submittal or any other claim, action, suit, cause of action or demand which the Department may have with respect to the disposal site, except as provided by 310 CMR 40.0184(1).

(5) No provision in 310 CMR 40.0180 shall be construed to relieve any person from any obligation to conduct response actions in response to any release of oil and/or hazardous material which does not meet the criteria in 310 CMR 40.0183(2)(b).

40.0184: continued

(6) The provision of a Downgradient Property Status Submittal, or a Modification of a Downgradient Property Status Submittal, to the Department pursuant to 310 CMR 40.0183 or 310 CMR 40.0187, respectively, shall not be construed as, or operate as, barring, diminishing, or in any way affecting any legal or equitable right, defense, claim, demand or cause of action that the person providing such Submittal may have under applicable law.

(7) Notwithstanding any provision in 310 CMR 40.0180 to the contrary, any person subject to an administrative consent order, judicial consent decree or Departmental Memorandum of Understanding shall comply with the terms and provisions therewith and the requirements of 310 CMR 40.0670.

40.0185: Maintenance of Downgradient Property Status

(1) Each person providing a Downgradient Property Status Submittal, or a Modification of a Downgradient Property Status Submittal, to the Department shall meet the following requirements to maintain such Downgradient Property Status:

- (a) no act of such person causes the release, contributes to the release, or causes such release to become worse than it otherwise would be;
- (b) to the extent that such person has ownership or possession of the downgradient property, such person provides reasonable access to the downgradient property which is the subject of the Downgradient Property Status Submittal to employees, agents, and contractors of the Department and to other persons conducting response actions;
- (c) such person undertakes reasonable steps to prevent the exposure of human and environmental receptors to oil and/or hazardous material at the downgradient property which is the subject of the Submittal;
- (d) if such person elects to undertake response actions after providing the Submittal to the Department, conducts such response actions in compliance with M.G.L. c. 21E and 310 CMR 40.0000;
- (e) such person makes reasonable efforts to identify persons who may be responsible or potentially responsible for the release and provides the notice required by 310 CMR 40.0183(5) to such persons; and
- (f) such person avoids engaging in any activity which could prevent or impede the implementation of reasonably likely response actions in the future.

(2) Based upon site-specific circumstances, the Department may require a person who provides a Downgradient Property Status Submittal, or a Modification of a Downgradient Property Status Submittal, to the Department to develop and implement a management plan for the property in order to prevent, eliminate, or minimize danger to health, safety, public welfare and/or the environment.

40.0186: Termination of Downgradient Property Status

- (1) Downgradient Property Status shall terminate if:
 - (a) information indicates that the criteria in 310 CMR 40.0183(2) are no longer being met;
 - (b) the person providing the Downgradient Property Status Submittal fails to meet the requirements in 310 CMR 40.0185 for maintaining such Status;
 - (c) the person providing the Downgradient Property Status Submittal notifies the Department in writing that such person intends to perform Comprehensive Response Actions in accordance with 310 CMR 40.0800;
 - (d) the Department establishes Interim Deadlines in accordance with 310 CMR 40.0167 for the person providing the Downgradient Property Status Submittal; or
 - (e) the Downgradient Property Status Submittal or Modification of a Downgradient Property Status Submittal is modified to terminate Downgradient Property Status.

(2) Any person having Downgradient Property Status who gains knowledge of information which indicates that the criteria in 310 CMR 40.0183(2) are no longer being met shall provide written notice thereof to the Department within 60 days of gaining such knowledge.

40.0317: Releases and Threats of Release Which Do Not Require Notification

Notwithstanding the provisions of 310 CMR 40.0311 through 40.0315, the following releases and threats of release of oil and/or hazardous material are exempt from the notification requirements set forth in 310 CMR 40.0300:

- (1) releases of oil that occur during normal handling and transfer operations at an oil facility, if the releases are completely captured by a properly functioning oil/water separator; provided, however, that releases of oil which exceed the capacity of the oil/water separator, and that releases of oil from the oil/water separator, itself, in excess of its discharge permit limits, shall be subject to the notification requirements set forth in 310 CMR 40.0300;
- (2) releases or threats of release of gasoline or diesel fuel that result from the rupture of the fuel tank of a passenger vehicle as a result of an accident involving that vehicle;
- (3) releases of oil and/or hazardous material that are discharged or emitted from an outfall, stack or other point source, or as fugitive emissions, any of which are regulated under and have received a valid permit, license, or approval, or which are operating under a valid registration, order or guideline issued under a federal or state statute or regulation, unless the release:
 - (a) exceeds the amount allowed by the permit, license, approval, registration, order or guideline; and
 - (b) represents an Imminent Hazard to health, safety, public welfare or the environment. This provision shall not relieve any person from any other duty to notify which may exist under any other statute or regulation, nor shall it in any way limit the authority of any other agency, political subdivision or authority of the federal or state government or of any office or division of the Department to enforce or otherwise carry out the duties assigned to it by law;
- (4) releases of radionuclides regulated by EPA under 42 USC • 9602, 33 USC • 1321 and 1361, and 40 CFR Part 302 *et seq.*;
- (5) releases of forbidden, Class A or Class B explosives, as defined in 49 CFR • 173.50, 173.53 and 173.88 respectively, if the explosives are under military transport or supervision and the U.S. Army Explosive Ordnance responds to the release;
- (6) releases of methane, propane, and other component compounds associated with a release of natural gas, natural gas liquids and liquified natural gas;
- (7) sheens:
 - (a) resulting from emissions or discharges from outboard motors in recreational use; or
 - (b) associated with normal surface water runoff from roadways, driveways, and parking lots;
- (8) releases of hazardous material indicated by residues in the environment:
 - (a) emanating from a point of original application of lead-based paint;
 - (b) resulting from emissions from the exhaust of an engine; or
 - (c) resulting from the application of pesticides in a manner consistent with their labelling;
- (9) releases of oil and/or hazardous material related to coal, coal ash, or wood ash, excluding wood ash resulting from the combustion of lumber or wood products that have been treated with chemical preservatives;
- (10) releases of oil and/or hazardous material resulting from the land application, reuse, or disposal of wastewater residuals and/or dredged spoils conducted in accordance with an approval, permit or certification issued by the Department under the authority of 310 CMR 32.00, 314 CMR 9.00, M.G.L. c. 21, • 26 through 53, M.G.L. c. 111, • 17, M.G.L. c. 83, • 6 and 7 and c. 21A, • 14 and any regulations promulgated thereunder;
- (11) releases of oil and/or hazardous material in groundwater detected by sampling conducted by Public Water Supply owners or operators under 310 CMR 22.00 as indicated by the presence of oil and/or hazardous material in a public water supply source;

40.0317: continued

- (12) releases of oil and/or hazardous material resulting or emanating from:
 - (a) the asphalt binder in bituminous pavement;
 - (b) piers, pilings and building foundation structures;
 - (c) landscaping timbers in use;
 - (d) utility poles in use; or
 - (e) building materials that are in good repair and still serving their original intended use;
- (13) releases indicated solely by the presence of oil and/or hazardous material in soils that are treated, recycled, reused or disposed of at a facility licensed, permitted or approved by the Department, provided that:
 - (a) the soil has been excavated and transported from a disposal site in compliance with 310 CMR 40.0000; and
 - (b) the facility is operated in a manner consistent with the terms and conditions of its license, permit or approval;
- (14) releases of oil and/or hazardous material that require notification solely because an RP, PRP or Other Person obtains knowledge of media concentrations and/or site conditions that meet one or more of the sets of criteria set forth in 310 CMR 40.0311 through 310 CMR 40.0315, when such media concentration value(s) and/or knowledge of site conditions resulted from a sampling, analytical or observational error, as established by a preponderance of the evidence and/or as verified by additional sampling, analyses, and/or observation, within the applicable time period for notification;
- (15) releases of oil and/or hazardous material that require notification solely because an RP, PRP or Other Person obtains knowledge of soil concentrations equal to or greater than one or more applicable Reportable Concentrations, as specified in 310 CMR 40.0315, where a Limited Removal Action conducted under the provisions of 310 CMR 40.0318 has reduced soil concentrations of oil and/or hazardous material at the disposal site to an amount less than the Reportable Concentration(s), within the allowable time period for notification;
- (16) releases indicated by the presence of oil and/or hazardous material in concentrations or quantities which would otherwise meet one or more of the sets of criteria set forth in 310 CMR 40.0313 through 310 CMR 40.0315 at a disposal site where:
 - (a) a response action is being undertaken in compliance with the provisions of 310 CMR 40.0000 to address such release;
 - (b) a release notification was previously provided to the Department for the disposal site on which the release has been observed or documented; and
 - (c) such presence of oil and/or hazardous material is consistent with the types, nature, exposure potential and quantities of oil and/or hazardous material for which that notification was provided to the Department;
- (17) releases indicated by the presence of oil and/or hazardous material at disposal sites for which a determination or statement as specified in 310 CMR 40.0317(17)(a) through (e) has been provided, in concentrations that would otherwise meet one or more of the sets of criteria set forth in 310 CMR 40.0313 or 40.0315, unless the presence of such oil and/or hazardous material would negate or change such determinations or statements were that presence taken into account in the preparation thereof, or changes in activities, uses, and/or exposures at the disposal site require notification to the Department pursuant to the provisions of 310 CMR 40.0020. In this context, determinations or statements include:
 - (a) a disposal site where a Response Action Outcome Statement has been submitted to the Department in compliance with the provisions of 310 CMR 40.1000,
 - (b) a disposal site where a No Further Action Letter has been submitted to the Department in compliance with the provisions of 310 CMR 40.0600,
 - (c) a disposal site where the Department has made a written determination that no further actions are required,
 - (d) a disposal site where an LSP Evaluation Opinion has been submitted to the Department in compliance with 310 CMR 40.0600 stating either that the site is not a disposal site for which notification is required pursuant to 310 CMR 40.0300 and no further response actions are required or that completed response actions meet the requirements of a Response Action Outcome, or

40.0317: continued

- (e) a disposal site where a Waiver Completion Statement has been submitted to the Department in compliance with the provisions of 310 CMR 40.537 and/or 310 CMR 40.0630.
- (18) threats of release indicated by the outcome of tank tests specified in 310 CMR 40.0314, where a tank test outcome has resulted from a testing error, as documented within the allowable time period for notification by an additional test conducted on identical and unrepaired underground storage tank system elements;
- (19) releases of oil and/or hazardous material to:
 - (a) an underground utility vault if such releases are completely contained within the vault; or
 - (b) the interior of a building, provided such releases are completely contained within the building;
- (20) releases of chloroform in groundwater attributable to naturally-occurring ecological processes and/or leakage or discharges from a public water supply system;
- (21) releases of oil or waste oil of less than a Reportable Quantity that result in a sheen on a surface water, provided that:
 - (a) federal officials receive notice of such release pursuant to the Federal Water Pollution Control Act as amended;
 - (b) a response occurs as directed by those federal officials and according to other federal, state or local requirements applicable to such a release and response;
 - (c) the sheen does not persist for more than 24 consecutive hours; and
 - (d) the sheen does not recur at the same location within any 30 day period; and
- (22) arsenic, beryllium or nickel in Boston Blue Clay or arsenic in an area documented by the U.S. Geological Survey or in other scientific literature as an area of elevated arsenic measured in soil or groundwater that
 - (a) is consistently present in the environment at and in the vicinity of the sampling location;
 - (b) is solely attributable to natural geologic or ecologic conditions; and
 - (c) has not been mobilized or transferred to another environmental medium or increased in concentration in an environmental medium as a result of anthropogenic activities.

40.0318: Limited Removal Actions

- (1) Limited Removal Actions may be undertaken by RPs, PRPs or Other Persons prior to notification to the Department of those "120 Day Notification" releases described in 310 CMR 40.0315.
- (2) Limited Removal Actions shall not be initiated or continued:
 - (a) after obtaining knowledge that a release or threat of release requires notification under the "2 Hour" or "72 Hour" notification provisions of 310 CMR 40.0311 through 40.0314, whether or not notification has been made to the Department;
 - (b) following notification to the Department by any person listed at 310 CMR 40.0331 of any release or threat of release of oil and/or hazardous material at the disposal site which requires notification under 310 CMR 40.0315; or
 - (c) at any Location to Be Investigated or disposal site subject to the provisions of 310 CMR 40.0600.
- (3) RPs, PRPs or Other Persons who undertake Limited Removal Actions shall conform to the Response Action Performance Standard specified in 310 CMR 40.0191.
- (4) Limited Removal Actions shall be restricted to the excavation and off-site recycling, reuse, treatment, and/or disposal of not more than the following cumulative volumes of soil removed from a disposal site with measured concentrations of oil or hazardous material equal to or greater than an applicable Reportable Concentration:
 - (a) not more than 100 cubic yards of soil contaminated solely by a release of oil or waste oil; and
 - (b) not more than 20 cubic yards of soil contaminated by a release of hazardous material or a mixture of oil or waste oil and hazardous material.



Print

PART I ADMINISTRATION OF THE GOVERNMENT
(Chapters 1 through 182)

TITLE II EXECUTIVE AND ADMINISTRATIVE OFFICERS OF THE
COMMONWEALTH

CHAPTER 21E MASSACHUSETTS OIL AND HAZARDOUS MATERIAL RELEASE PREVENTION AND
RESPONSE ACT

Section 5D Exemption from liability for release of oil or hazardous material for persons who did not
cause or contribute to the release

Section 5D. (a) A person who would otherwise be liable for a release of oil or hazardous material solely pursuant to clause (1) of paragraph (a) of section 5 and who did not cause or contribute to the release, shall not be liable to the commonwealth or to any other person for contribution, response action costs for property damage pursuant to this chapter or for property damage under the common law, except for liability under a contract, if such release of oil or hazardous material has migrated in or on groundwater or surface water from a known source where the following requirements are met:

- (1) such oil or hazardous material was released from an upgradient or upstream source or sources and has come to be located at the downgradient or downstream property owned or operated by such person;
 - (2) such person does not own or operate and did not previously own or operate any portion of the site from or at which the source of the release originated;
 - (3) such person complies with the notice requirements of this chapter and regulations promulgated thereto; and
 - (4) such person:
 - (i) provides reasonable access to the portion of the site it owns or operates to employees, agents and contractors of the department for all purposes authorized by this chapter and to other persons for the purpose of conducting response actions pursuant to this chapter and regulations promulgated thereto;
 - (ii) takes reasonable steps (a) to prevent the exposure of people to oil or hazardous material by fencing or otherwise preventing access to the portion of the site under its control, and (b) to prevent an imminent hazard at the downgradient or downstream property owned or operated by such person by taking immediate response actions at the portion of the site owned or operated by such person;
 - (iii) does not unreasonably impede or interfere with the performance of response actions or the restoration of natural resources by any person; and
 - (iv) does not exacerbate the release of oil or hazardous material affecting the downgradient or downstream property owned or operated by such person.
- (b) With respect to a release of oil or hazardous material that has migrated in or on groundwater or surface water from an unknown source, a person who can demonstrate by a preponderance of the evidence that it otherwise meets all of the criteria in paragraph (a) shall not be liable to the commonwealth or to any other person for contribution, response action costs or property damage pursuant to this chapter or for property damage under the common law, except for liability arising under a contract.
- (c) The department shall promulgate regulations in order to define the terms "known source" and "unknown source".
- (d) Nothing in this section shall relieve any person of any liability for releases or threats of release of oil or hazardous material:
- (1) that are exacerbated, caused, or contributed to by the acts or failure to act pursuant to this chapter of such downgradient or downstream owner or operator, or its agent or employee;
 - (2) that originate on the downgradient or downstream property owned or operated by such person;

(3) that originate on the downgradient or downstream property owned or operated by such person and commingled with the oil or hazardous material migrating from upgradient or upstream property in groundwater or surface water; or

(4) to which there is a new exposure resulting from an act or failure to act pursuant to this chapter of a downgradient or downstream owner or operator or such person's agent or employee.

(e) Nothing in this section shall affect the department's audit authority, as provided by paragraph (o) of section 3A.

(f) If the commonwealth prevails in an action brought pursuant to this chapter for recovery of costs incurred by the department against a party that has asserted liability protection pursuant to this section, the court may impose sanctions in accordance with paragraph (e) of section 5.

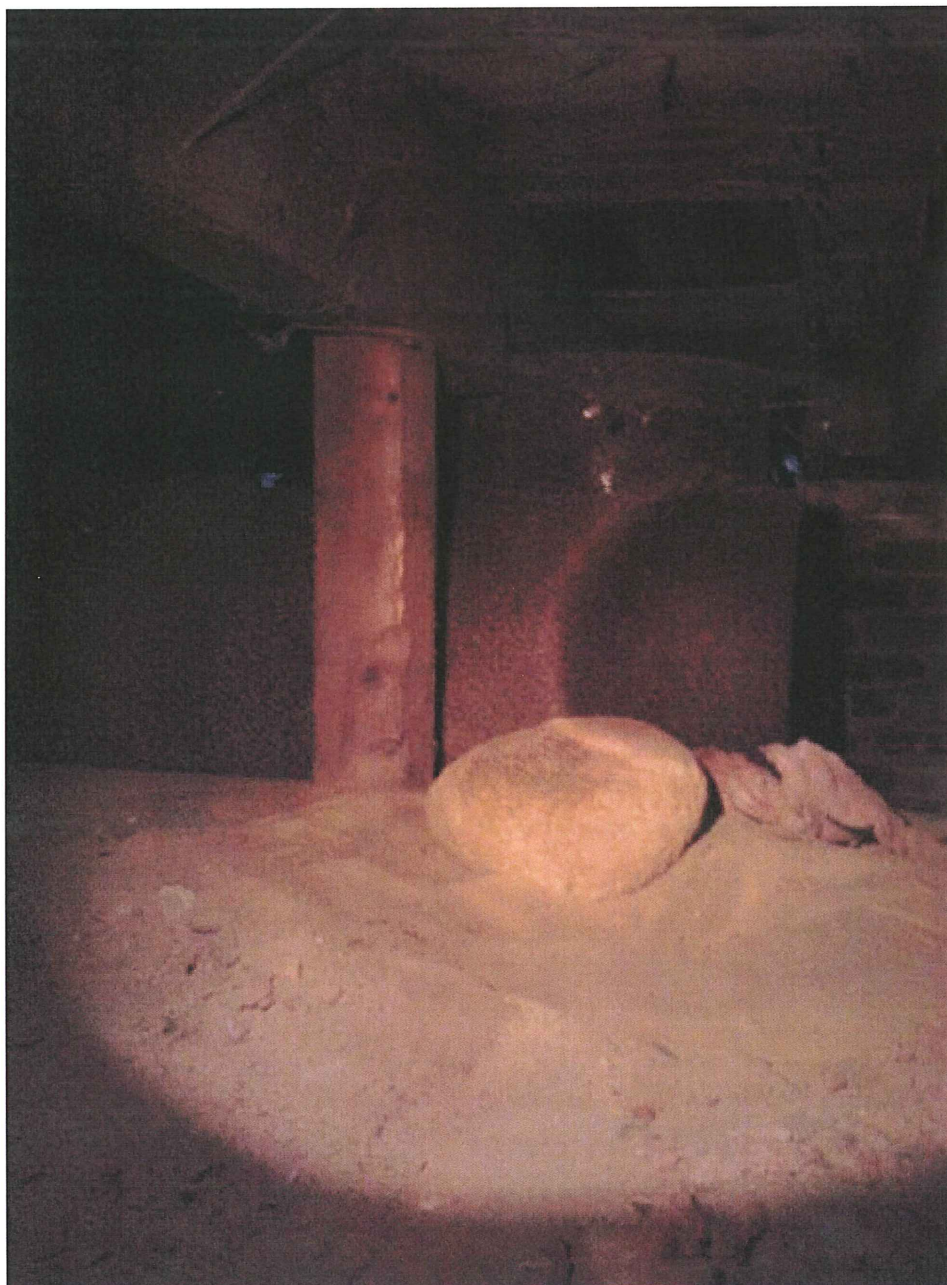
APPENDIX C



Steel tank beneath building



"Port hole" to steel tank off northeast corner of subject building



Eastern end of tank, facing north

APPENDIX D

	MA GW-1	BEA-1S	BEA-1D	MW-1	MW-5
	(ug/L)	1/28/2011	1/28/2011	1/28/2011	1/28/2011
		139472-1	139472-2	139472-3	139472-4
EPA 8260B					
Vinyl Chloride	2		<3		
Methylene Chloride	5		<13		
Trichloroethene	5		25		
cis-1,3-Dichloropropene	0.4		<2		
trans-1,3-Dichloropropene	0.4		<2		
Tetrachloroethene	5		260	9	
Dibromochloromethane	2		<3		
1,1,2,2-Tetrachloroethane	2		<3		

	MA GW-2	BEA-1S	BEA-1D	MW-1	MW-5
	(ug/L)	1/28/2011	1/28/2011	1/28/2011	1/28/2011
		139472-1	139472-2	139472-3	139472-4
EPA 8260B					
Vinyl Chloride	2		<3		
Carbon Tetrachloride	2		<3		
Tetrachloroethene	50		260		

	MA RCGW-1	BEA-1S	BEA-1D	MW-1	MW-5
	(mg/L)	1/28/2011	1/28/2011	1/28/2011	1/28/2011
		139472-1	139472-2	139472-3	139472-4
EPA 8260B					
Vinyl Chloride	0.002		<0.003		
Methylene Chloride	0.005		<0.013		
Carbon Tetrachloride	0.002		<0.003		
Trichloroethene	0.005		0.025		
1,2-Dichloropropane	0.003		<0.003		
Bromodichloromethane	0.003		<0.003		
cis-1,3-Dichloropropene	0.0004	<0.0004	<0.002	<0.0004	<0.0004
trans-1,3-Dichloropropene	0.0004	<0.0004	<0.002	<0.0004	<0.0004
Tetrachloroethene	0.005		0.26	0.009	
Dibromochloromethane	0.002		<0.003		
1,1,2,2-Tetrachloroethane	0.002		<0.003		

GROUNDWATER ANALYTICAL

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February 4, 2011

Mr. David Bennett
Bennett Environmental Associates, Inc.
P.O. Box 1743
Brewster, MA 02631

LABORATORY REPORT

Project: T.O. Harwich/BEA-10288
Lab ID: 139424
Received: 01-28-11

Dear Dave:

Enclosed are the analytical results for the above referenced project. The project was processed for Priority turnaround.

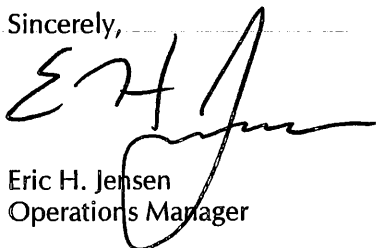
This letter authorizes the release of the analytical results, and should be considered a part of this report. This report contains a sample receipt report detailing the samples received, a project narrative indicating project changes and non-conformances, a quality control report, and a statement of our state certifications.

The analytical results contained in this report meet all applicable NELAC standards, except as may be specifically noted, or described in the project narrative. The analytical results relate only to the samples received. This report may only be used or reproduced in its entirety.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Should you have any questions concerning this report, please do not hesitate to contact me.

Sincerely,



Eric H. Jensen
Operations Manager

EHJ/elm
Enclosures

Sample Receipt Report

Project: **T.O. Harwich/BEA-10288**
Client: **Bennett Environmental Associates, Inc.**
Lab ID: **139424**

Delivery: **GWA Courier**
Airbill: **n/a**
Lab Receipt: **01-28-11**

Temperature: **4.1°C**
Chain of Custody: **Present**
Custody Seal(s): **n/a**

Lab ID	Field ID			Matrix	Sampled	Method			Notes
139424-1	BOT(E)@1			Soil	1/27/11 12:30	TPH by GC ASTM D3328-00 Mod			
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C1324950	250 mL Amber Glass	Proline	BX38100	None	n/a	n/a	n/a		

**ASTM Method D3328-00 (Modified)
Hydrocarbon Fingerprint by GC/FID**

Field ID: **BOT(E)@1**
Project: **T.O. Harwich/BEA-10288**
Client: **Bennett Environmental Associates, Inc.**

Laboratory ID: **139424-1**
Sampled: **01-27-11 12:30**
Received: **01-28-11 15:30**
Extracted: **01-31-11 15:00**
Analyzed: **02-02-11 13:44**
Analyst: **MB**

Matrix: **Soil**
Container: **250 mL Amber Glass**
Preservation: **Cool**

QC Batch ID: **HF-3183-M**
Instrument ID: **GC4 HP 5890**
Sample Weight: **16 g**
Final Volume: **1 mL**
Dilution Factor: **1**
% Solids: **98**

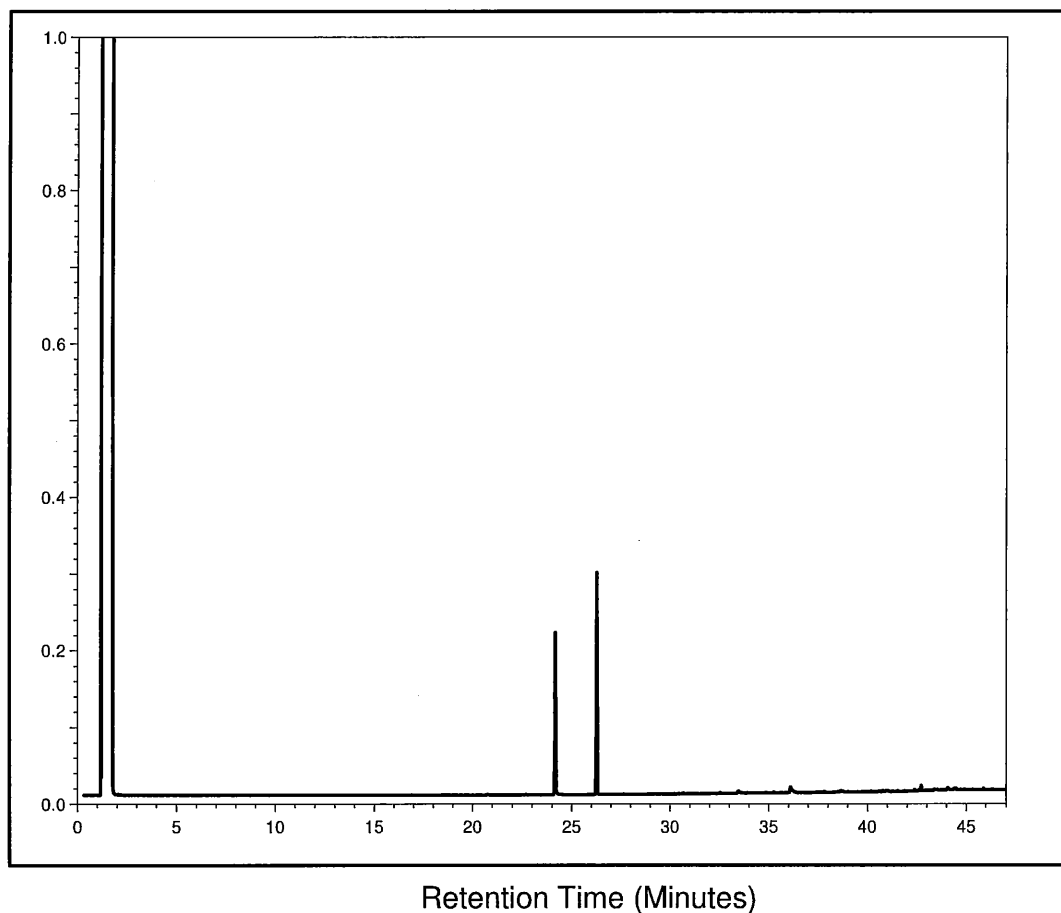
Qualitative Identification				
No petroleum product was identified for this sample.				
Analyte	Concentration		Notes	Reporting Limit
Total Petroleum Hydrocarbons	BRL			60
QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
<i>ortho</i> -Terphenyl	2.6	1.9	75 %	60 - 140 %

Method Reference: Comparison of Waterborne Petroleum Oils by Gas Chromatography, Annual Book of ASTM Standards, Volume 11.02, American Society for Testing and Materials (2000).
Method modified to quantify total petroleum hydrocarbons in the range n-C 9 through n-C 36. Results are quantified on the basis of a series of aromatic and aliphatic hydrocarbons, using 5-alpha-androstane as an internal standard.
Sample extraction performed by microwave accelerated solvent technique. Results are reported on a dry weight basis.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

Lab ID: 139424-01

Hydrocarbons Laboratory



Project Narrative

Project: T.O. Harwich/BEA-10288
Client: Bennett Environmental Associates, Inc.

Lab ID: 139424
Received: 01-28-11 15:30

A. Documentation and Client Communication

The following documentation discrepancies, and client changes or amendments were noted for this project:

1. Project was not received with a turnaround time checked. Project was processed for a Priority turnaround time with a due date of 2-4-11.

B. Method Modifications, Non-Conformances and Observations

The sample(s) in this project were analyzed by the references analytical method(s), and no method modifications, non-conformances or analytical issues were noted, except as indicated below:

1. No method modifications, non-conformances or analytical issues were noted.

Quality Assurance/Quality Control

A. Program Overview

Groundwater Analytical conducts an active Quality Assurance program to ensure the production of high quality, valid data. This program closely follows the guidance provided by *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, US EPA QAMS-005/80 (1980), and *Test Methods for Evaluating Solid Waste*, US EPA, SW-846, Update III (1996).

Quality Control protocols include written Standard Operating Procedures (SOPs) developed for each analytical method. SOPs are derived from US EPA methodologies and other established references. Standards are prepared from commercially obtained reference materials of certified purity, and documented for traceability.

Quality Assessment protocols for most organic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. All samples, standards, blanks, laboratory control samples, matrix spikes and sample duplicates are spiked with internal standards and surrogate compounds. All instrument sequences begin with an initial calibration verification standard and a blank; and excepting GC/MS sequences, all sequences close with a continuing calibration standard. GC/MS systems are tuned to appropriate ion abundance criteria daily, or for each 12 hour operating period, whichever is more frequent.

Quality Assessment protocols for most inorganic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. Standard curves are derived from one reagent blank and four concentration levels. Curve validity is verified by standard recoveries within plus or minus ten percent of the curve.

B. Definitions

Batches are used as the basic unit for Quality Assessment. A Batch is defined as twenty or fewer samples of the same matrix which are prepared together for the same analysis, using the same lots of reagents and the same techniques or manipulations, all within the same continuum of time, up to but not exceeding 24 hours.

Laboratory Control Samples are used to assess the accuracy of the analytical method. A Laboratory Control Sample consists of reagent water or sodium sulfate spiked with a group of target analytes representative of the method analytes. Accuracy is defined as the degree of agreement of the measured value with the true or expected value. Percent Recoveries for the Laboratory Control Samples are calculated to assess accuracy.

Method Blanks are used to assess the level of contamination present in the analytical system. Method Blanks consist of reagent water or an aliquot of sodium sulfate. Method Blanks are taken through all the appropriate steps of an analytical method. Sample data reported is not corrected for blank contamination.

Surrogate Compounds are used to assess the effectiveness of an analytical method in dealing with each sample matrix. Surrogate Compounds are organic compounds which are similar to the target analytes of interest in chemical behavior, but which are not normally found in environmental samples. Percent Recoveries are calculated for each Surrogate Compound.

**Quality Control Report
Laboratory Control Sample**

Category: ASTM D3328-00 Mod Hydrocarbon Fingerprint
QC Batch ID: HF-3183-M
Matrix: Soil
Units: mg/Kg

Instrument ID: GC4 HP 5890
Extracted: 01-31-11 15:00
Analyzed: 02-02-11 11:54
Analyst: MB

Analyte	Spiked	Measured	Recovery	QC Limits
Fuel Oil No. 2	130	96	74 %	60 - 140 %
QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
ortho-Terphenyl	2.7	2.0	76 %	30 - 140 %

Method Reference: Comparison of Waterborne Petroleum Oils by Gas Chromatography, Annual Book of ASTM Standards, Volume 11.02, American Society for Testing and Materials (2000).
Method modified to quantify total petroleum hydrocarbons in the range n-C 9 through n-C 36. Results are quantified on the basis of a series of aromatic and aliphatic hydrocarbons, using 5-alpha-androstane as an internal standard.
Sample extraction performed by microwave accelerated solvent technique.

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

**Quality Control Report
Method Blank**

Category: **ASTM D3328-00 Mod Hydrocarbon Fingerprint**
QC Batch ID: **HF-3183-M**
Matrix: **Soil**

Instrument ID: **GC4 HP 5890**
Extracted: **01-31-11 15:00**
Analyzed: **02-02-11 10:59**
Analyst: **MB**

Analyte	Concentration	Notes	Units	Reporting Limit
Total Petroleum Hydrocarbons	BRL		mg/Kg	60

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
ortho-Terphenyl	2.7	2.0	74 %	60 - 140 %

Method Reference: Comparison of Waterborne Petroleum Oils by Gas Chromatography, Annual Book of ASTM Standards, Volume 11.02, American Society for Testing and Materials (2000).
Method modified to quantify total petroleum hydrocarbons in the range n-C 9 through n-C 36. Results are quantified on the basis of a series of aromatic and aliphatic hydrocarbons, using 5-alpha-androstane as an internal standard.
Sample extraction performed by microwave accelerated solvent technique.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

Certifications and Approvals

Groundwater Analytical maintains environmental laboratory certification in a variety of states.

Copies of our current certificates may be obtained from our website:

<http://www.groundwateranalytical.com/qualifications.htm>

CONNECTICUT

Department of Health Services, PH-0586

Potable Water, Wastewater, Solid Waste and Soil

http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/Out_State.pdf

MASSACHUSETTS

Department of Environmental Protection, M-MA-103

Potable Water and Non-Potable Water

<http://public.dep.state.ma.us/abcert/abcert.aspx>

Department of Labor,

Asbestos Analytical Services, Class A

Division of Occupational Safety, AA000195

http://www.mass.gov/dos/forms/la-rpt_list_aa.pdf

NEW HAMPSHIRE

Department of Environmental Services, 202708

Potable Water, Non-Potable Water, Solid and Chemical Materials

<http://www4.egov.nh.gov/DES/NHELAP>

NEW YORK

Department of Health, 11754

Potable Water, Non-Potable Water, Solid and Hazardous Waste

<http://www.wadsworth.org/labcert/elap/comm.html>

RHODE ISLAND

Department of Health,

Potable and Non-Potable Water Microbiology, Organic and Inorganic Chemistry

Division of Laboratories, LAO00054

<http://www.health.ri.gov/labs/outofstatelabs.pdf>

U.S. DEPARTMENT OF AGRICULTURE

USDA, Soil Permit, S-53921

Foreign soil import permit

VERMONT

Department of Health, VT-87643

Potable Water

http://healthvermont.gov/enviro/ph_lab/water_test.aspx#cert

Certifications and Approvals

MASSACHUSETTS

Department of Environmental Protection, M-MA-103

Groundwater Analytical maintains MassDEP environmental laboratory certification for only the methods and analytes listed below. Analyses for certified analytes are conducted in accordance with MassDEP certification standards, except as may be specifically noted in the project narrative.

Potable Water (Drinking Water)		Non-Potable Water (Wastewater)	
Analyte	Method	Analyte	Method
1,2-Dibromo-3-Chloropropane	EPA 504.1	Aluminum	EPA 200.8
1,2-Dibromoethane	EPA 504.1	Ammonia-N	Lachat 10-107-06-1-B
Alkalinity, Total	SM 2320-B	Antimony	EPA 200.7
Antimony	EPA 200.8	Antimony	EPA 200.8
Arsenic	EPA 200.8	Arsenic	EPA 200.7
Barium	EPA 200.7	Arsenic	EPA 200.8
Barium	EPA 200.8	Beryllium	EPA 200.7
Beryllium	EPA 200.7	Beryllium	EPA 200.8
Beryllium	EPA 200.8	Beta-BHC	EPA 608
Cadmium	EPA 200.7	Biochemical Oxygen Demand	SM 5210-B
Cadmium	EPA 200.8	Cadmium	EPA 200.7
Calcium	EPA 200.7	Cadmium	EPA 200.8
Chlorine, Residual Free	SM 4500-CL-G	Calcium	EPA 200.7
Chromium	EPA 200.7	Chemical Oxygen Demand	SM 5220-D
Copper	EPA 200.7	Chlordane	EPA 608
Copper	EPA 200.8	Chloride	EPA 300.0
Cyanide, Total	Lachat 10-204-00-1-A	Chlorine, Total Residual	SM 4500-CL-G
E. Coli (Treatment and Distribution)	Enz. Sub. SM 9223	Chromium	EPA 200.7
E. Coli (Treatment and Distribution)	NA-MUG SM 9222-G	Chromium	EPA 200.8
Fecal Coliform (Source Water)	MF SM 9222-D	Cobalt	EPA 200.7
Fluoride	EPA 300.0	Cobalt	EPA 200.8
Fluoride	SM 4500-F-C	Copper	EPA 200.7
Haloacetic Acids	EPA 552.2	Copper	EPA 200.8
Heterotrophic Plate Count	SM 9215-B	Cyanide, Total	Lachat 10-204-00-1-A
Lead	EPA 200.8	DDD	EPA 608
Mercury	EPA 245.1	DDE	EPA 608
Nickel	EPA 200.7	DDT	EPA 608
Nickel	EPA 200.8	Delta-BHC	EPA 608
Nitrate-N	EPA 300.0	Dieldrin	EPA 608
Nitrate-N	Lachat 10-107-04-1-C	Endosulfan I	EPA 608
Nitrite-N	EPA 300.0	Endosulfan II	EPA 608
Nitrite-N	Lachat 10-107-04-1-C	Endosulfan Sulfate	EPA 608
pH	SM 4500-H-B	Endrin	EPA 608
Selenium	EPA 200.8	Endrin Aldehyde	EPA 608
Silver	EPA 200.7	Gamma-BHC	EPA 608
Silver	EPA 200.8	Hardness (CaCO ₃), Total	EPA 200.7
Sodium	EPA 200.7	Hardness (CaCO ₃), Total	SM 2340-B
Sulfate	EPA 300.0	Heptachlor	EPA 608
Thallium	EPA 200.8	Heptachlor Epoxide	EPA 608
Total Coliform (Treatment and Distribution)	Enz. Sub. SM 9223	Iron	EPA 200.7
Total Coliform (Treatment and Distribution)	MF SM 9222-B	Kjeldahl-N	Lachat 10-107-06-02-D
Total Dissolved Solids	SM 2540-C	Lead	EPA 200.7
Trihalomethanes	EPA 524.2	Magnesium	EPA 200.7
Turbidity	SM 2130-B	Manganese	EPA 200.7
Volatile Organic Compounds	EPA 524.2	Manganese	EPA 200.8
Non-Potable Water (Wastewater)		Mercury	EPA 245.1
Analyte	Method	Molybdenum	EPA 200.7
Aldrin	EPA 608	Molybdenum	EPA 200.8
Alkalinity, Total	SM 2320-B	Nickel	EPA 200.7
Alpha-BHC	EPA 608	Nickel	EPA 200.8
Aluminum	EPA 200.7	Nitrate-N	EPA 300.0
		Nitrate-N	Lachat 10-107-04-1-C
		Non-Filterable Residue	SM 2540-D
		Oil and Grease	EPA 1664

Certifications and Approvals

MASSACHUSETTS**Department of Environmental Protection, M-MA-103**

Groundwater Analytical maintains MassDEP environmental laboratory certification for only the methods and analytes listed below. Analyses for certified analytes are conducted in accordance with MassDEP certification standards, except as may be specifically noted in the project narrative.

Non-Potable Water (Wastewater)

Analyte	Method
Orthophosphate	Lachat 10-115-01-1-A
pH	SM 4500-H-B
Phenolics, Total	EPA 420.4
Phenolics, Total	Lachat 10-210-00-1-B
Phosphorus, Total	Lachat 10-115-01-1-C
Phosphorus, Total	SM 4500-P-B,E
Polychlorinated Biphenyls (Oil)	EPA 600/4-81-045
Polychlorinated Biphenyls (Water)	EPA 608
Potassium	EPA 200.7
Selenium	EPA 200.7
Selenium	EPA 200.8
Silver	EPA 200.7
Sodium	EPA 200.7
Specific Conductivity	SM 2510-B
Strontium	EPA 200.7
Sulfate	EPA 300.0
SVOC-Acid Extractables	EPA 625
SVOC-Base/Neutral Extractables	EPA 625
Thallium	EPA 200.7
Thallium	EPA 200.8
Titanium	EPA 200.7
Total Dissolved Solids	SM 2540-C
Total Organic Carbon	SM 5310-B
Toxaphene	EPA 608
Vanadium	EPA 200.7
Vanadium	EPA 200.8
Volatile Aromatics	EPA 602
Volatile Aromatics	EPA 624
Volatile Halocarbons	EPA 624
Zinc	EPA 200.7
Zinc	EPA 200.8

GROUNDWATER ANALYTICAL

Groundwater Analytical, Inc.
P.O. Box 1200
228 Main Street
Buzzards Bay, MA 02532

Telephone (508) 759-4441
FAX (508) 759-4475
www.groundwateranalytical.com

February 4, 2011

Mr. David Bennett
Bennett Environmental Associates, Inc.
P.O. Box 1743
Brewster, MA 02631

LABORATORY REPORT

Project: **T. O. Harwich/BEA10-10288**
Lab ID: **139468**
Received: **01-31-11**

Dear Dave:

Enclosed are the analytical results for the above referenced project. The project was processed for Priority turnaround.

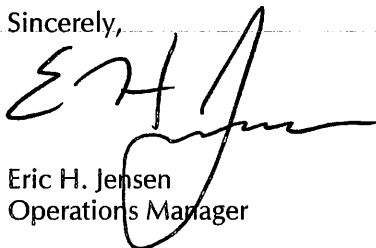
This letter authorizes the release of the analytical results, and should be considered a part of this report. This report contains a sample receipt report detailing the samples received, a project narrative indicating project changes and non-conformances, a quality control report, and a statement of our state certifications.

The analytical results contained in this report meet all applicable NELAC standards, except as may be specifically noted, or described in the project narrative. The analytical results relate only to the samples received. This report may only be used or reproduced in its entirety.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Should you have any questions concerning this report, please do not hesitate to contact me.

Sincerely,



Eric H. Jensen
Operations Manager

EHJ/elm
Enclosures

Sample Receipt Report

Project: **T. O. Harwich/BEA10-10288**
Client: **Bennett Environmental Associates, Inc.**
Lab ID: **139468**

Delivery: **GWA Courier**
Airbill: **n/a**
Lab Receipt: **01-31-11**

Temperature: **3.4°C**
Chain of Custody: **Present**
Custody Seal(s): **n/a**

Lab ID	Field ID		Matrix	Sampled	Method				Notes
139468-1	Tank Sludge		Soil	1/28/11 12:30	TPH by GC ASTM D3328-00 Mod				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C1295361	250 mL Amber Glass	Proline	BX37966	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
139468-2	HB-3: 10-12		Soil	1/28/11 13:15	TPH by GC ASTM D3328-00 Mod				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C1295362	250 mL Amber Glass	Proline	BX37966	None	n/a	n/a	n/a		

**ASTM Method D3328-00 (Modified)
Hydrocarbon Fingerprint by GC/FID**

Field ID: Tank Sludge
Project: T. O. Harwich/BEA10-10288
Client: Bennett Environmental Associates, Inc.

Matrix: Soil
Container: 250 mL Amber Glass
Preservation: Cool

Laboratory ID: 139468-1
Sampled: 01-28-11 12:30
Received: 01-31-11 14:40
Extracted: 01-31-11 22:30
Analyzed: 02-02-11 23:06
Analyst: MB

QC Batch ID: HF-3183-M
Instrument ID: GC4 HP 5890
Sample Weight: 16 g
Final Volume: 1 mL
Dilution Factor: 1
% Solids: 99

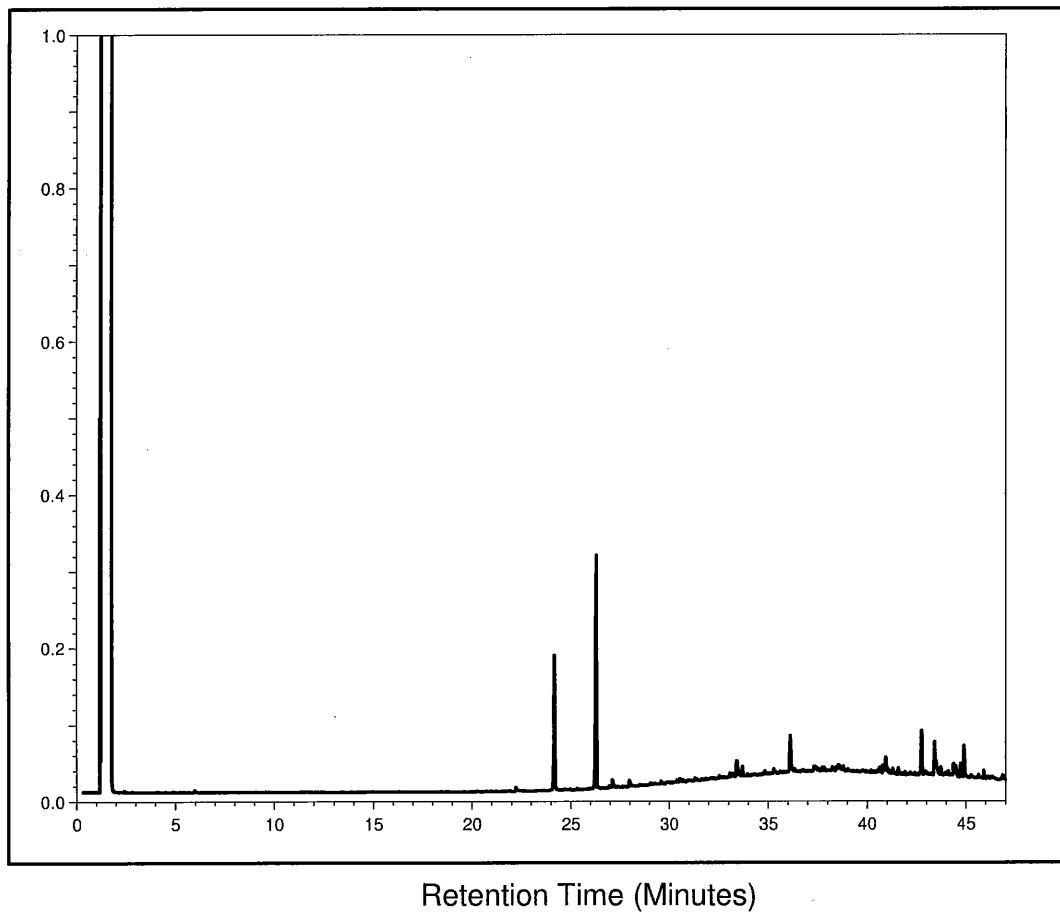
Qualitative Identification				
This sample has GC/FID characteristics that are similar to:				
1. Petroleum products in the Lubricating Oil (n-C19 to n-C36) range.				
Analyte	Concentration		Notes	Reporting Limit
Total Petroleum Hydrocarbons	76			60
QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
ortho-Terphenyl	2.6	1.5	57 %	60 - 140 %

Method Reference: Comparison of Waterborne Petroleum Oils by Gas Chromatography, Annual Book of ASTM Standards, Volume 11.02, American Society for Testing and Materials (2000).
Method modified to quantify total petroleum hydrocarbons in the range n-C 9 through n-C 36. Results are quantified on the basis of a series of aromatic and aliphatic hydrocarbons, using 5-alpha-androstane as an internal standard.
Sample extraction performed by microwave accelerated solvent technique. Results are reported on a dry weight basis.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

Lab ID: 139468-01

Hydrocarbons Laboratory



**ASTM Method D3328-00 (Modified)
Hydrocarbon Fingerprint by GC/FID**

Field ID:	HB-3: 10-12	Matrix:	Soil
Project:	T. O. Harwich/BEA10-10288	Container:	250 mL Amber Glass
Client:	Bennett Environmental Associates, Inc.	Preservation:	Cool
Laboratory ID:	139468-2	QC Batch ID:	HF-3183-M
Sampled:	01-28-11 13:15	Instrument ID:	GC4 HP 5890
Received:	01-31-11 14:40	Sample Weight:	16 g
Extracted:	01-31-11 22:30	Final Volume:	1 mL
Analyzed:	02-03-11 00:01	Dilution Factor:	1
Analyst:	MB	% Solids:	85

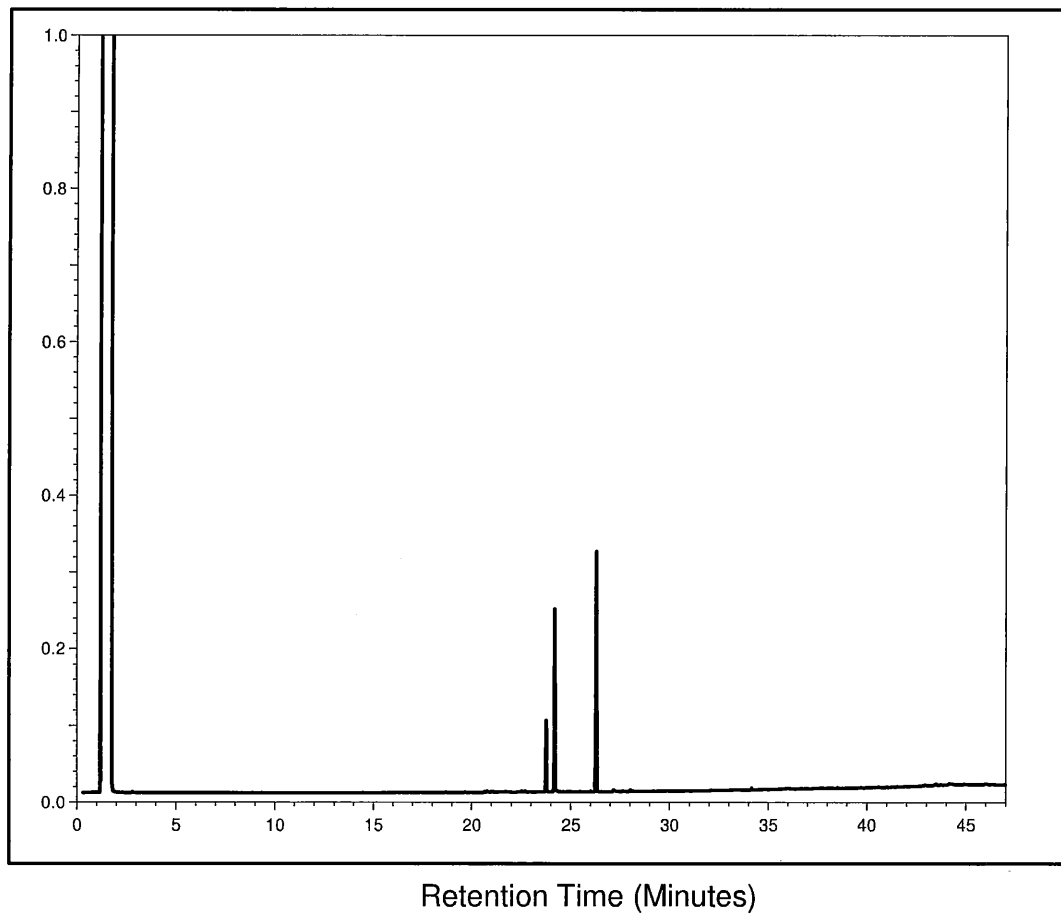
Qualitative Identification				
No petroleum product was identified for this sample.				
Analyte	Concentration		Notes	Reporting Limit
Total Petroleum Hydrocarbons	BRL			67
QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
<i>ortho</i> -Terphenyl	3.0	2.2	74 %	60 - 140 %

Method Reference: Comparison of Waterborne Petroleum Oils by Gas Chromatography, Annual Book of ASTM Standards, Volume 11.02, American Society for Testing and Materials (2000).
Method modified to quantify total petroleum hydrocarbons in the range n-C 9 through n-C 36. Results are quantified on the basis of a series of aromatic and aliphatic hydrocarbons, using 5-alpha-androstane as an internal standard.
Sample extraction performed by microwave accelerated solvent technique. Results are reported on a dry weight basis.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

Lab ID: 139468-02

Hydrocarbons Laboratory



Project Narrative

Project: **T. O. Harwich/BEA10-10288**
Client: **Bennett Environmental Associates, Inc.**

Lab ID: **139468**
Received: **01-31-11 14:40**

A. Documentation and Client Communication

The following documentation discrepancies, and client changes or amendments were noted for this project:

1. No documentation discrepancies, changes, or amendments were noted.

B. Method Modifications, Non-Conformances and Observations

The sample(s) in this project were analyzed by the references analytical method(s), and no method modifications, non-conformances or analytical issues were noted, except as indicated below:

1. No method modifications, non-conformances or analytical issues were noted.

CHAIN-OF-CUSTODY RECORD AND WORK ORDER

ANALYSIS REQUEST

☐ 10 Business Days
☒ 5 Business Days
☐ RUSH RAN-
(rush requires Rush Authorization Number)
☐ Please Email to: dbennett@benvue-eg.com
☐ Please FAX to: _____

BILLING

☒ Purchase Order No.: 10288
☐ Third Party Billing: _____
GWA Quote: _____

10:11:00	Project Number: BEA10-10288	Bennett Environment
	Address: 1573 Main St./P.O. Box 1743	
	City / State / Zip: Brewster, MA 02631	
	Telephone: 508-896-1706	
	Project Manager: David Bennett	
	Sampler Name: David Bennett	

INSTRUCTIONS: Use separate line for each container (except replicates).

[illegible]


ANALYSIS REQUEST

[illegible]

REMARKS / SPECIAL INSTRUCTIONS

☒ YES ☐ NO MCP Data Certification required.
☐ YES ☒ NO MCP Drinking Water Sample Included.
 (Volatile analyses require duplicate collection and Trip Blanks).
☐ Analyze Duplicates and Trips Blanks only if positive results.

☐ YES ☒ NO MCP Data Certification required.

Signature: 

Page 8 of 8

DATA QUALITY OBJECTIVES

Regulatory Program		Project Specific QC
State	Standard	Deliverables
CT	<input checked="" type="checkbox"/> MCF GW-1/RS-1	<input type="checkbox"/> PWS Form
ME	<input type="checkbox"/> MCF GW-2/S-2	<input type="checkbox"/> MWRA
MA	<input type="checkbox"/> NY STARS	<input type="checkbox"/>
NH	<input type="checkbox"/> Drinking Water	
NY	<input type="checkbox"/> Wastewater	
RI	<input type="checkbox"/> Waste Disposal	
VT	<input type="checkbox"/> Dredge Material	
VT	<input type="checkbox"/>	

Many regulatory programs and EPA methods require project specific QC. Project specific QC includes Sample Duplicates, Matrix Spikes, and/or Matrix Spike Duplicates. Laboratory QC is not project specific unless prearranged. Project specific QC samples are charged on a per sample basis. Each MS, MSD and Sample Duplicate requires an additional sample aliquot.

Project Specific QC Required	Selection of QC Sample
<input type="checkbox"/> Sample Duplicate	<input type="checkbox"/> Please use sampler
<input type="checkbox"/> Matrix Spike	<input checked="" type="checkbox"/>
<input type="checkbox"/> Matrix Spike Duplicate	

Project Specific QC

Many regulatory programs and EPA methods require project specific QC. Project specific QC includes Sample Duplicates, Matrix Spikes, and/or Matrix Spike Duplicates. Laboratory QC is not project specific unless prearranged. Project specific QC samples are charged on a per sample basis. Each MS, MSD and Sample Duplicate requires an additional sample aliquot.

Project Specific QC Required	Selection of QC Sample
<input type="checkbox"/> Sample Duplicate	<input type="checkbox"/> Please use sample;
<input type="checkbox"/> Matrix Spike	
<input type="checkbox"/> Matrix Spike Duplicate	

CHAIN-OF-CUSTODY RECORD

NOTE: All samples submitted subject to Standard Terms and Conditions on reverse hereof.			
Requisition Number:	Date	Time	Received by:
134	1/28/11	14:30	BFA Sample Rds
Requisition by:	Date	Time	Received by:
BFA	1/30/11	14:00	SpL Davis
Requisitioned by:	Date	Time	Received by:
SpL Davis	1/31/11	14:00	SpL Davis
Requisitioned by:	Date	Time	Received by:
SpL Davis	1/31/11	14:00	SpL Davis
Method of Shipment:		Shipping/Alt/bill Number:	
GAWA Courier		1338	
Customs Seal Number:		Customs Seal Number:	
<input type="checkbox"/> UPS <input type="checkbox"/> Hand <input type="checkbox"/>		<input type="checkbox"/> Express Mail <input type="checkbox"/> Federal Express	

Quality Assurance/Quality Control

A. Program Overview

Groundwater Analytical conducts an active Quality Assurance program to ensure the production of high quality, valid data. This program closely follows the guidance provided by *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, US EPA QAMS-005/80 (1980), and *Test Methods for Evaluating Solid Waste*, US EPA, SW-846, Update III (1996).

Quality Control protocols include written Standard Operating Procedures (SOPs) developed for each analytical method. SOPs are derived from US EPA methodologies and other established references. Standards are prepared from commercially obtained reference materials of certified purity, and documented for traceability.

Quality Assessment protocols for most organic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. All samples, standards, blanks, laboratory control samples, matrix spikes and sample duplicates are spiked with internal standards and surrogate compounds. All instrument sequences begin with an initial calibration verification standard and a blank; and excepting GC/MS sequences, all sequences close with a continuing calibration standard. GC/MS systems are tuned to appropriate ion abundance criteria daily, or for each 12 hour operating period, whichever is more frequent.

Quality Assessment protocols for most inorganic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. Standard curves are derived from one reagent blank and four concentration levels. Curve validity is verified by standard recoveries within plus or minus ten percent of the curve.

B. Definitions

Batches are used as the basic unit for Quality Assessment. A Batch is defined as twenty or fewer samples of the same matrix which are prepared together for the same analysis, using the same lots of reagents and the same techniques or manipulations, all within the same continuum of time, up to but not exceeding 24 hours.

Laboratory Control Samples are used to assess the accuracy of the analytical method. A Laboratory Control Sample consists of reagent water or sodium sulfate spiked with a group of target analytes representative of the method analytes. Accuracy is defined as the degree of agreement of the measured value with the true or expected value. Percent Recoveries for the Laboratory Control Samples are calculated to assess accuracy.

Method Blanks are used to assess the level of contamination present in the analytical system. Method Blanks consist of reagent water or an aliquot of sodium sulfate. Method Blanks are taken through all the appropriate steps of an analytical method. Sample data reported is not corrected for blank contamination.

Surrogate Compounds are used to assess the effectiveness of an analytical method in dealing with each sample matrix. Surrogate Compounds are organic compounds which are similar to the target analytes of interest in chemical behavior, but which are not normally found in environmental samples. Percent Recoveries are calculated for each Surrogate Compound.

**Quality Control Report
Laboratory Control Sample**

Category: ASTM D3328-00 Mod Hydrocarbon Fingerprint
QC Batch ID: HF-3183-M
Matrix: Soil
Units: mg/Kg

Instrument ID: GC4 HP 5890
Extracted: 01-31-11 15:00
Analyzed: 02-02-11 11:54
Analyst: MB

Analyte	Spiked	Measured	Recovery	QC Limits
Fuel Oil No. 2	130	96	74 %	60 - 140 %

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
ortho-Terphenyl	2.7	2.0	76 %	30 - 140 %

Method Reference: Comparison of Waterborne Petroleum Oils by Gas Chromatography, Annual Book of ASTM Standards, Volume 11.02, American Society for Testing and Materials (2000).
Method modified to quantify total petroleum hydrocarbons in the range n-C 9 through n-C 36. Results are quantified on the basis of a series of aromatic and aliphatic hydrocarbons, using 5-alpha-androstane as an internal standard.
Sample extraction performed by microwave accelerated solvent technique.

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

Quality Control Report Method Blank

Category: ASTM D3328-00 Mod Hydrocarbon Fingerprint
QC Batch ID: HF-3183-M
Matrix: Soil

Instrument ID: GC4 HP 5890
Extracted: 01-31-11 15:00
Analyzed: 02-02-11 10:59
Analyst: MB

Analyte	Concentration	Notes	Units	Reporting Limit
Total Petroleum Hydrocarbons	BRL		mg/Kg	60

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
ortho-Terphenyl	2.7	2.0	74 %	60 - 140 %

Method Reference: Comparison of Waterborne Petroleum Oils by Gas Chromatography, Annual Book of ASTM Standards, Volume 11.02, American Society for Testing and Materials (2000).
Method modified to quantify total petroleum hydrocarbons in the range n-C 9 through n-C 36. Results are quantified on the basis of a series of aromatic and aliphatic hydrocarbons, using 5-alpha-androstane as an internal standard.
Sample extraction performed by microwave accelerated solvent technique.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

Certifications and Approvals

Groundwater Analytical maintains environmental laboratory certification in a variety of states.

Copies of our current certificates may be obtained from our website:

<http://www.groundwateranalytical.com/qualifications.htm>

CONNECTICUT

Department of Health Services, PH-0586

Potable Water, Wastewater, Solid Waste and Soil

http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/Out_State.pdf

MASSACHUSETTS

Department of Environmental Protection, M-MA-103

Potable Water and Non-Potable Water

<http://public.dep.state.ma.us/labcert/labcert.aspx>

Department of Labor,

Asbestos Analytical Services, Class A

Division of Occupational Safety, AA000195

http://www.mass.gov/dos/forms/la-rpt_list_aa.pdf

NEW HAMPSHIRE

Department of Environmental Services, 202708

Potable Water, Non-Potable Water, Solid and Chemical Materials

<http://www4.egov.nh.gov/DES/NHELAP>

NEW YORK

Department of Health, 11754

Potable Water, Non-Potable Water, Solid and Hazardous Waste

<http://www.wadsworth.org/labcert/elap/comm.html>

RHODE ISLAND

Department of Health,

Potable and Non-Potable Water Microbiology, Organic and Inorganic Chemistry

Division of Laboratories, LAO00054

<http://www.health.ri.gov/labs/outofstatelabs.pdf>

U.S. DEPARTMENT OF AGRICULTURE

USDA, Soil Permit, S-53921

Foreign soil import permit

VERMONT

Department of Health, VT-87643

Potable Water

http://healthvermont.gov/enviro/ph_lab/water_test.aspx#cert

Certifications and Approvals

MASSACHUSETTS

Department of Environmental Protection, M-MA-103

Groundwater Analytical maintains MassDEP environmental laboratory certification for only the methods and analytes listed below. Analyses for certified analytes are conducted in accordance with MassDEP certification standards, except as may be specifically noted in the project narrative.

Potable Water (Drinking Water)		Non-Potable Water (Wastewater)	
Analyte	Method	Analyte	Method
1,2-Dibromo-3-Chloropropane	EPA 504.1	Aluminum	EPA 200.8
1,2-Dibromoethane	EPA 504.1	Ammonia-N	Lachat 10-107-06-1-B
Alkalinity, Total	SM 2320-B	Antimony	EPA 200.7
Antimony	EPA 200.8	Antimony	EPA 200.8
Arsenic	EPA 200.8	Arsenic	EPA 200.7
Barium	EPA 200.7	Arsenic	EPA 200.8
Barium	EPA 200.8	Beryllium	EPA 200.7
Beryllium	EPA 200.7	Beryllium	EPA 200.8
Beryllium	EPA 200.8	Beta-BHC	EPA 608
Cadmium	EPA 200.7	Biochemical Oxygen Demand	SM 5210-B
Cadmium	EPA 200.8	Cadmium	EPA 200.7
Calcium	EPA 200.7	Cadmium	EPA 200.8
Chlorine, Residual Free	SM 4500-CL-G	Calcium	EPA 200.7
Chromium	EPA 200.7	Chemical Oxygen Demand	SM 5220-D
Copper	EPA 200.7	Chlordane	EPA 608
Copper	EPA 200.8	Chloride	EPA 300.0
Cyanide, Total	Lachat 10-204-00-1-A	Chlorine, Total Residual	SM 4500-CL-G
E. Coli (Treatment and Distribution)	Enz. Sub. SM 9223	Chromium	EPA 200.7
E. Coli (Treatment and Distribution)	NA-MUG SM 9222-G	Chromium	EPA 200.8
Fecal Coliform (Source Water)	MF SM 9222-D	Cobalt	EPA 200.7
Fluoride	EPA 300.0	Cobalt	EPA 200.8
Fluoride	SM 4500-F-C	Copper	EPA 200.7
Haloacetic Acids	EPA 552.2	Copper	EPA 200.8
Heterotrophic Plate Count	SM 9215-B	Cyanide, Total	Lachat 10-204-00-1-A
Lead	EPA 200.8	DDD	EPA 608
Mercury	EPA 245.1	DDE	EPA 608
Nickel	EPA 200.7	DDT	EPA 608
Nickel	EPA 200.8	Delta-BHC	EPA 608
Nitrate-N	EPA 300.0	Dieldrin	EPA 608
Nitrate-N	Lachat 10-107-04-1-C	Endosulfan I	EPA 608
Nitrite-N	EPA 300.0	Endosulfan II	EPA 608
Nitrite-N	Lachat 10-107-04-1-C	Endosulfan Sulfate	EPA 608
pH	SM 4500-H-B	Endrin	EPA 608
Selenium	EPA 200.8	Endrin Aldehyde	EPA 608
Silver	EPA 200.7	Gamma-BHC	EPA 608
Silver	EPA 200.8	Hardness (CaCO ₃), Total	EPA 200.7
Sodium	EPA 200.7	Hardness (CaCO ₃), Total	SM 2340-B
Sulfate	EPA 300.0	Heptachlor	EPA 608
Thallium	EPA 200.8	Heptachlor Epoxide	EPA 608
Total Coliform (Treatment and Distribution)	Enz. Sub. SM 9223	Iron	EPA 200.7
Total Coliform (Treatment and Distribution)	MF SM 9222-B	Kjeldahl-N	Lachat 10-107-06-02-D
Total Dissolved Solids	SM 2540-C	Lead	EPA 200.7
Trihalomethanes	EPA 524.2	Magnesium	EPA 200.7
Turbidity	SM 2130-B	Manganese	EPA 200.7
Volatile Organic Compounds	EPA 524.2	Manganese	EPA 200.8
Non-Potable Water (Wastewater)		Mercury	EPA 245.1
Analyte	Method	Molybdenum	EPA 200.7
Aldrin	EPA 608	Molybdenum	EPA 200.8
Alkalinity, Total	SM 2320-B	Nickel	EPA 200.7
Alpha-BHC	EPA 608	Nickel	EPA 200.8
Aluminum	EPA 200.7	Nitrate-N	EPA 300.0
		Nitrate-N	Lachat 10-107-04-1-C
		Non-Filterable Residue	SM 2540-D
		Oil and Grease	EPA 1664

Certifications and Approvals

MASSACHUSETTS**Department of Environmental Protection, M-MA-103**

Groundwater Analytical maintains MassDEP environmental laboratory certification for only the methods and analytes listed below. Analyses for certified analytes are conducted in accordance with MassDEP certification standards, except as may be specifically noted in the project narrative.

Non-Potable Water (Wastewater)

Analyte	Method
Orthophosphate	Lachat 10-115-01-1-A
pH	SM 4500-H-B
Phenolics, Total	EPA 420.4
Phenolics, Total	Lachat 10-210-00-1-B
Phosphorus, Total	Lachat 10-115-01-1-C
Phosphorus, Total	SM 4500-P-B,E
Polychlorinated Biphenyls (Oil)	EPA 600/4-81-045
Polychlorinated Biphenyls (Water)	EPA 608
Potassium	EPA 200.7
Selenium	EPA 200.7
Selenium	EPA 200.8
Silver	EPA 200.7
Sodium	EPA 200.7
Specific Conductivity	SM 2510-B
Strontium	EPA 200.7
Sulfate	EPA 300.0
SVOC-Acid Extractables	EPA 625
SVOC-Base/Neutral Extractables	EPA 625
Thallium	EPA 200.7
Thallium	EPA 200.8
Titanium	EPA 200.7
Total Dissolved Solids	SM 2540-C
Total Organic Carbon	SM 5310-B
Toxaphene	EPA 608
Vanadium	EPA 200.7
Vanadium	EPA 200.8
Volatile Aromatics	EPA 602
Volatile Aromatics	EPA 624
Volatile Halocarbons	EPA 624
Zinc	EPA 200.7
Zinc	EPA 200.8

GROUNDWATER ANALYTICAL

DB/

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February 7, 2011

Mr. David Bennett
Bennett Environmental Associates, Inc.
P.O. Box 1743
Brewster, MA 02631

LABORATORY REPORT

Project: **Town of Harwich/BEA10-10288**
Lab ID: **139472**
Received: **01-31-11**

Dear Dave:

Enclosed are the analytical results for the above referenced project. The project was processed for Priority turnaround.

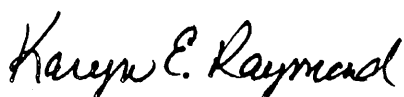
This letter authorizes the release of the analytical results, and should be considered a part of this report. This report contains a sample receipt report detailing the samples received, a project narrative indicating project changes and non-conformances, a quality control report, and a statement of our state certifications.

The analytical results contained in this report meet all applicable NELAC standards, except as may be specifically noted, or described in the project narrative. The analytical results relate only to the samples received. This report may only be used or reproduced in its entirety.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Should you have any questions concerning this report, please do not hesitate to contact me.

Sincerely,



Karyn E. Raymond
Project Manager

KER/elm
Enclosures

Sample Receipt Report

Project: **Town of Harwich/BEA10-10288**
 Client: **Bennett Environmental Associates, Inc.**
 Lab ID: **139472**

Delivery: **GWA Courier**
 Airbill: **n/a**
 Lab Receipt: **01-31-11**

Temperature: **3.4°C**
 Chain of Custody: **Present**
 Custody Seal(s): **n/a**

Lab ID	Field ID		Matrix	Sampled	Method				Notes
139472-1	BEA-1S		Aqueous	1/28/11 13:00	EPA 8260B TCL Volatile Organics				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C1321054	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		
C1321053	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		
C1321052	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
139472-2	BEA-1D		Aqueous	1/28/11 12:30	EPA 8260B TCL Volatile Organics				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C1321051	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		
C1321041	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		
C1321031	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
139472-3	MW-1		Aqueous	1/28/11 15:00	EPA 8260B TCL Volatile Organics				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C1313590	40 mL VOA Vial	n/a	n/a	HCL	n/a	n/a	n/a		
C1313591	40 mL VOA Vial	n/a	n/a	HCL	n/a	n/a	n/a		
C1313592	40 mL VOA Vial	n/a	n/a	HCL	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
139472-4	MW-5		Aqueous	1/28/11 14:15	EPA 8260B TCL Volatile Organics				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C1321050	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		
C1321040	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		
C1321030	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
139472-5	BEA-1S		Aqueous	1/28/11 13:00	Formaldehyde				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C1293048	1 L Amber Glass	Proline	BX37804	None	n/a	n/a	n/a		

Data Certification

Project: Town of Harwich/BEA10-10288
Client: Bennett Environmental Associates, Inc.

Lab ID: 139472
Received: 01-31-11 14:40

Mass DEP Analytical Protocol Certification Form					
Project Location: n/a		MA DEP RTN: n/a			
This Form provides certifications for the following data set:					
EPA 8260B: 139472-1,-2,-3,-4					
Sample Matrices: Groundwater/Surface (X) Soil/Sediment () Drinking Water () Air () Other ()					
CAM Protocol (check all that apply below):					
8260 VOC CAM II A (X)	7470/7471 Hg CAM III B ()	Mass DEP VPH CAM IV A ()	8081 Pesticides CAM V B ()	7196 Hex Cr CAM VI B ()	Mass DEP APH CAM IX A ()
8270 SVOC CAM II B ()	7010 Metals CAM III C ()	Mass DEP EPH CAM IV B ()	8151 Herbicides CAM V C ()	8330 Explosives CAM VIII A ()	TO-15 VOC CAM IX B ()
6010 Metals CAM III A ()	6020 Metals CAM III D ()	8082 PCB CAM V A ()	9012 Cyanide/PAC CAM VI A ()	6860 Perchlorate CAM VIII B ()	
An affirmative response to questions A through F are required for "Presumptive Certainty" status.					
A.	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?				Yes ✓
B.	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?				Yes ✓
C.	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?				Yes ✓
D.	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?				Yes ✓
E.	VPH, EPH and APH methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).				n/a
F.	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?				Yes ✓
Responses to questions G, H and I below are required for "Presumptive Certainty" status.					
G.	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?				No ✓
Data User Note: Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40.1056(2)(k) and WSC-07-350.					
H.	Were all QC performance standards specified in the CAM protocol(s) achieved?				No ✓
I.	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?				No ✓
All negative responses must be addressed in an attached laboratory narrative.					
I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.					
Signature: <i>Karyn E. Raymond</i>		Position: Project Manager			
Printed Name: Karyn E. Raymond		Date: 02-07-11			

See narrative for
UEA considerations

EPA Method 8260B TCL Volatile Organics by GC/MS

Field ID: **BEA-15**
Project: **Town of Harwich/BEA10-10288**
Client: **Bennett Environmental Associates, Inc.**

Laboratory ID: **139472-1**
Sampled: **01-28-11 13:00**
Received: **01-31-11 14:40**
Analyzed: **02-03-11 09:33**
Analyst: **LMG**

Matrix: **Aqueous**
Container: **40 mL VOA Vial**
Preservation: **HCl/ Cool**

QC Batch ID: **VM10-1231-W**
Instrument ID: **MS-10 HP 6890**
Sample Volume: **5 mL**
Dilution Factor: **1**

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
74-87-3	Chloromethane	BRL		ug/L	0.5
75-01-4	Vinyl Chloride	BRL		ug/L	0.5
74-83-9	Bromomethane	BRL		ug/L	0.5
75-00-3	Chloroethane	BRL		ug/L	0.5
75-35-4	1,1-Dichloroethene	BRL		ug/L	0.5
67-64-1	Acetone	BRL		ug/L	10
75-15-0	Carbon Disulfide	BRL		ug/L	5
75-09-2	Methylene Chloride	BRL		ug/L	3
156-60-5	trans- 1,2-Dichloroethene	BRL		ug/L	0.5
1634-04-4	Methyl tert- butyl Ether (MTBE)	BRL		ug/L	0.5
75-34-3	1,1-Dichloroethane	BRL		ug/L	0.5
156-59-2	cis- 1,2-Dichloroethene	BRL		ug/L	0.5
78-93-3	2-Butanone (MEK)	BRL		ug/L	5
67-66-3	Chloroform	BRL		ug/L	0.5
71-55-6	1,1,1-Trichloroethane	BRL		ug/L	0.5
56-23-5	Carbon Tetrachloride	BRL		ug/L	0.5
71-43-2	Benzene	BRL		ug/L	0.5
107-06-2	1,2-Dichloroethane	BRL		ug/L	0.5
79-01-6	Trichloroethene	BRL		ug/L	0.5
78-87-5	1,2-Dichloropropane	BRL		ug/L	0.5
75-27-4	Bromodichloromethane	BRL		ug/L	0.5
10061-01-5	cis- 1,3-Dichloropropene	BRL		ug/L	0.4
108-10-1	4-Methyl-2-Pentanone (MIBK)	BRL		ug/L	5
108-88-3	Toluene	BRL		ug/L	0.5
10061-02-6	trans- 1,3-Dichloropropene	BRL		ug/L	0.4
79-00-5	1,1,2-Trichloroethane	BRL		ug/L	0.5
127-18-4	Tetrachloroethene	BRL		ug/L	0.5
591-78-6	2-Hexanone	BRL		ug/L	5
124-48-1	Dibromochloromethane	BRL		ug/L	0.5
108-90-7	Chlorobenzene	BRL		ug/L	0.5
100-41-4	Ethylbenzene	BRL		ug/L	0.5
108-38-3/106-42-3	meta- Xylene and para- Xylene	BRL		ug/L	0.5
95-47-6	ortho- Xylene	BRL		ug/L	0.5
100-42-5	Styrene	BRL		ug/L	0.5
75-25-2	Bromoform	BRL		ug/L	0.5
79-34-5	1,1,2,2-Tetrachloroethane	BRL		ug/L	0.5

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
Dibromofluoromethane	10	11	113 %	70 - 130 %
1,2-Dichloroethane-d ₄	10	11	112 %	70 - 130 %
Toluene-d ₈	10	11	114 %	70 - 130 %
4-Bromofluorobenzene	10	10	100 %	70 - 130 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Sample preparation performed by EPA Method 5030B.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

EPA Method 8260B TCL Volatile Organics by GC/MS

Field ID: **BEA-1D**
Project: **Town of Harwich/BEA10-10288**
Client: **Bennett Environmental Associates, Inc.**

Laboratory ID: **139472-2**
Sampled: **01-28-11 12:30**
Received: **01-31-11 14:40**
Analyzed: **02-03-11 09:55**
Analyst: **LMG**

Matrix: **Aqueous**
Container: **40 mL VOA Vial**
Preservation: **HCl/ Cool**

QC Batch ID: **VM10-1231-W**
Instrument ID: **MS-10 HP 6890**
Sample Volume: **5 mL**
Dilution Factor: **5**

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
74-87-3	Chloromethane	BRL		ug/L	3
75-01-4	Vinyl Chloride	BRL		ug/L	3
74-83-9	Bromomethane	BRL		ug/L	3
75-00-3	Chloroethane	BRL		ug/L	3
75-35-4	1,1-Dichloroethene	BRL		ug/L	3
67-64-1	Acetone	BRL		ug/L	50
75-15-0	Carbon Disulfide	BRL		ug/L	25
75-09-2	Methylene Chloride	BRL		ug/L	13
156-60-5	trans- 1,2-Dichloroethene	BRL		ug/L	3
1634-04-4	Methyl tert- butyl Ether (MTBE)	BRL		ug/L	3
75-34-3	1,1-Dichloroethane	BRL		ug/L	3
156-59-2	cis- 1,2-Dichloroethene	20		ug/L	3
78-93-3	2-Butanone (MEK)	BRL		ug/L	25
67-66-3	Chloroform	BRL		ug/L	3
71-55-6	1,1,1-Trichloroethane	BRL		ug/L	3
56-23-5	Carbon Tetrachloride	BRL		ug/L	3
71-43-2	Benzene	BRL		ug/L	3
107-06-2	1,2-Dichloroethane	BRL		ug/L	3
79-01-6	Trichloroethene	25		ug/L	3
78-87-5	1,2-Dichloropropane	BRL		ug/L	3
75-27-4	Bromodichloromethane	BRL		ug/L	3
10061-01-5	cis- 1,3-Dichloropropene	BRL		ug/L	2
108-10-1	4-Methyl-2-Pentanone (MIBK)	BRL		ug/L	25
108-88-3	Toluene	BRL		ug/L	3
10061-02-6	trans- 1,3-Dichloropropene	BRL		ug/L	2
79-00-5	1,1,2-Trichloroethane	BRL		ug/L	3
127-18-4	Tetrachloroethene	260		ug/L	3
591-78-6	2-Hexanone	BRL		ug/L	25
124-48-1	Dibromochloromethane	BRL		ug/L	3
108-90-7	Chlorobenzene	BRL		ug/L	3
100-41-4	Ethylbenzene	BRL		ug/L	3
108-38-3/106-42-3	meta- Xylene and para- Xylene	BRL		ug/L	3
95-47-6	ortho- Xylene	BRL		ug/L	3
100-42-5	Styrene	BRL		ug/L	3
75-25-2	Bromoform	BRL		ug/L	3
79-34-5	1,1,2,2-Tetrachloroethane	BRL		ug/L	3

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
Dibromofluoromethane	10	11	113 %	70 - 130 %
1,2-Dichloroethane-d ₄	10	11	112 %	70 - 130 %
Toluene-d ₈	10	11	115 %	70 - 130 %
4-Bromofluorobenzene	10	10	101 %	70 - 130 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Sample preparation performed by EPA Method 5030B.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

EPA Method 8260B TCL Volatile Organics by GC/MS

Field ID: MW-1
Project: Town of Harwich/BEA10-10288
Client: Bennett Environmental Associates, Inc.

Laboratory ID: 139472-3
Sampled: 01-28-11 15:00
Received: 01-31-11 14:40
Analyzed: 02-03-11 10:18
Analyst: LMG

Matrix: Aqueous
Container: 40 mL VOA Vial
Preservation: HCl/ Cool

QC Batch ID: VM10-1231-W
Instrument ID: MS-10 HP 6890
Sample Volume: 5 mL
Dilution Factor: 1

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
74-87-3	Chloromethane	BRL		ug/L	0.5
75-01-4	Vinyl Chloride	BRL		ug/L	0.5
74-83-9	Bromomethane	BRL		ug/L	0.5
75-00-3	Chloroethane	BRL		ug/L	0.5
75-35-4	1,1-Dichloroethene	BRL		ug/L	0.5
67-64-1	Acetone	BRL		ug/L	10
75-15-0	Carbon Disulfide	BRL		ug/L	5
75-09-2	Methylene Chloride	BRL		ug/L	3
156-60-5	trans- 1,2-Dichloroethene	BRL		ug/L	0.5
1634-04-4	Methyl tert- butyl Ether (MTBE)	BRL		ug/L	0.5
75-34-3	1,1-Dichloroethane	BRL		ug/L	0.5
156-59-2	cis- 1,2-Dichloroethene	0.5		ug/L	0.5
78-93-3	2-Butanone (MEK)	BRL		ug/L	5
67-66-3	Chloroform	BRL		ug/L	0.5
71-55-6	1,1,1-Trichloroethane	BRL		ug/L	0.5
56-23-5	Carbon Tetrachloride	BRL		ug/L	0.5
71-43-2	Benzene	BRL		ug/L	0.5
107-06-2	1,2-Dichloroethane	BRL		ug/L	0.5
79-01-6	Trichloroethene	0.5		ug/L	0.5
78-87-5	1,2-Dichloropropane	BRL		ug/L	0.5
75-27-4	Bromodichloromethane	BRL		ug/L	0.5
10061-01-5	cis- 1,3-Dichloropropene	BRL		ug/L	0.4
108-10-1	4-Methyl-2-Pentanone (MIBK)	BRL		ug/L	5
108-88-3	Toluene	BRL		ug/L	0.5
10061-02-6	trans- 1,3-Dichloropropene	BRL		ug/L	0.4
79-00-5	1,1,2-Trichloroethane	BRL		ug/L	0.5
127-18-4	Tetrachloroethene	9		ug/L	0.5
591-78-6	2-Hexanone	BRL		ug/L	5
124-48-1	Dibromochloromethane	BRL		ug/L	0.5
108-90-7	Chlorobenzene	BRL		ug/L	0.5
100-41-4	Ethylbenzene	BRL		ug/L	0.5
108-38-3/106-42-3	meta- Xylene and para- Xylene	BRL		ug/L	0.5
95-47-6	ortho- Xylene	BRL		ug/L	0.5
100-42-5	Styrene	BRL		ug/L	0.5
75-25-2	Bromoform	BRL		ug/L	0.5
79-34-5	1,1,2,2-Tetrachloroethane	BRL		ug/L	0.5

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
Dibromofluoromethane	10	12	117 %	70 - 130 %
1,2-Dichloroethane-d ₄	10	11	114 %	70 - 130 %
Toluene-d ₈	10	11	113 %	70 - 130 %
4-Bromofluorobenzene	10	10	99 %	70 - 130 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Sample preparation performed by EPA Method 5030B.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

EPA Method 8260B TCL Volatile Organics by GC/MS

Field ID: MW-5
Project: Town of Harwich/BEA10-10288
Client: Bennett Environmental Associates, Inc.

Laboratory ID: 139472-4
Sampled: 01-28-11 14:15
Received: 01-31-11 14:40
Analyzed: 02-03-11 10:40
Analyst: LMG

Matrix: Aqueous
Container: 40 mL VOA Vial
Preservation: HCl/ Cool

QC Batch ID: VM10-1231-W
Instrument ID: MS-10 HP 6890
Sample Volume: 5 mL
Dilution Factor: 1

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
74-87-3	Chloromethane	BRL		ug/L	0.5
75-01-4	Vinyl Chloride	BRL		ug/L	0.5
74-83-9	Bromomethane	BRL		ug/L	0.5
75-00-3	Chloroethane	BRL		ug/L	0.5
75-35-4	1,1-Dichloroethene	BRL		ug/L	0.5
67-64-1	Acetone	BRL		ug/L	10
75-15-0	Carbon Disulfide	BRL		ug/L	5
75-09-2	Methylene Chloride	BRL		ug/L	3
156-60-5	<i>trans</i> -1,2-Dichloroethene	BRL		ug/L	0.5
1634-04-4	Methyl <i>tert</i> -butyl Ether (MTBE)	BRL		ug/L	0.5
75-34-3	1,1-Dichloroethane	BRL		ug/L	0.5
156-59-2	<i>cis</i> -1,2-Dichloroethene	BRL		ug/L	0.5
78-93-3	2-Butanone (MEK)	BRL		ug/L	5
67-66-3	Chloroform	BRL		ug/L	0.5
71-55-6	1,1,1-Trichloroethane	BRL		ug/L	0.5
56-23-5	Carbon Tetrachloride	BRL		ug/L	0.5
71-43-2	Benzene	BRL		ug/L	0.5
107-06-2	1,2-Dichloroethane	BRL		ug/L	0.5
79-01-6	Trichloroethene	BRL		ug/L	0.5
78-87-5	1,2-Dichloropropane	BRL		ug/L	0.5
75-27-4	Bromodichloromethane	BRL		ug/L	0.5
10061-01-5	<i>cis</i> -1,3-Dichloropropene	BRL		ug/L	0.4
108-10-1	4-Methyl-2-Pentanone (MIBK)	BRL		ug/L	5
108-88-3	Toluene	BRL		ug/L	0.5
10061-02-6	<i>trans</i> -1,3-Dichloropropene	BRL		ug/L	0.4
79-00-5	1,1,2-Trichloroethane	BRL		ug/L	0.5
127-18-4	Tetrachloroethene	BRL		ug/L	0.5
591-78-6	2-Hexanone	BRL		ug/L	5
124-48-1	Dibromochloromethane	BRL		ug/L	0.5
108-90-7	Chlorobenzene	BRL		ug/L	0.5
100-41-4	Ethylbenzene	BRL		ug/L	0.5
108-38-3/106-42-3	<i>meta</i> -Xylene and <i>para</i> -Xylene	BRL		ug/L	0.5
95-47-6	<i>ortho</i> -Xylene	BRL		ug/L	0.5
100-42-5	Styrene	BRL		ug/L	0.5
75-25-2	Bromoform	BRL		ug/L	0.5
79-34-5	1,1,2,2-Tetrachloroethane	BRL		ug/L	0.5

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
Dibromofluoromethane	10	12	116 %	70 - 130 %
1,2-Dichloroethane-d ₄	10	12	115 %	70 - 130 %
Toluene-d ₈	10	11	114 %	70 - 130 %
4-Bromofluorobenzene	10	10	98 %	70 - 130 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Sample preparation performed by EPA Method 5030B.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

Project Narrative

Project: Town of Harwich/BEA10-10288
Client: Bennett Environmental Associates, Inc.

Lab ID: 139472
Received: 01-31-11 14:40

A. Documentation and Client Communication

The following documentation discrepancies, and client changes or amendments were noted for this project:

1. No documentation discrepancies, changes, or amendments were noted.

B. Method Modifications, Non-Conformances and Observations

The sample(s) in this project were analyzed by the references analytical method(s), and no method modifications, non-conformances or analytical issues were noted, except as indicated below:

1. EPA 8260B Note: Sample 139472-2. Sample was diluted prior to analysis. Dilution was required to keep all target analytes within calibration. Elevated reporting limits are above the recommended CAM reporting limits for the target analytes.
2. EPA 8260B Note: Samples 139472-1 through -4. Samples were analyzed for only selected target analytes, as requested by client.
3. EPA 8260B Note: Samples 139472-1 through -4. Acetone did not meet the required minimum average response factor in the ICAL. Response factor was below the recommended limit in the CCV.
4. EPA 8260B Note: Samples 139472-1 through -4. Relative percent deviation for Tetrachloroethene was above the recommended limit in the CCV.

ESA screening of
known COCs
previously doc.

negative has
considered for
specific use
as > 2400-1

GROUNDWATER ANALYTICAL

228 Main Street, P.O. Box 1200
Barnstable, MA 02532
Telephone (508) 758-4441 • FAX (508) 758-4475
www.groundwateranalytical.com

CHAIN-OF-CUSTODY RECORD AND WORK ORDER

Project Name: Town of Harwich
 Project Number: BEA10-10280
 Sampler Name: STW/DGB
 Project Manager: David Bennett
 Address: 1573 Main St./P.O. Box 1743
 City/State/Zip: Barnstable, MA 02631
 Telephone: (508) 896-1706
 Firm: Bennett Environmental Assoc.
 STANDARD (10 Business Days)
 PRIORITY (5 Business Days)
 RUSH (RAN) (Rush requires Rush Authorization Number)
 Please Email to: DBennett@bennett-en.com
 Please FAX to: _____
 BILLING
 Purchase Order No.: 10280
 Third Party Billing: _____
 GWA Quote: _____

INSTRUCTIONS: Use separate line for each container (except replicates).

DATE	SAMPLE IDENTIFICATION	Matrix	Type	Containers	Preservation	LABORATORY NUMBER (Lab Use Only)
11/10/00	BEA-1S	GROUNDWATER	COMPOSITE	1200L or Plastic	NO	10280
11/10/00	BEA-1S	GROUNDWATER	COMPOSITE	1200L or Plastic	YES	10280
12-30	BEA-1D	GROUNDWATER	COMPOSITE	1200L or Plastic	NO	10280
3-20	MW-1	GROUNDWATER	COMPOSITE	1200L or Plastic	YES	10280
2-15	MW-5	GROUNDWATER	COMPOSITE	1200L or Plastic	NO	10280

ANALYSIS REQUEST

Metals: ☐ Lead and Copper ☐ 515.1 ☐ 515.2 ☐ 515.3 ☐ 515.4 ☐ 515.5 ☐ 515.6 ☐ 515.7 ☐ 515.8 ☐ 515.9 ☐ 515.10 ☐ 515.11 ☐ 515.12 ☐ 515.13 ☐ 515.14 ☐ 515.15 ☐ 515.16 ☐ 515.17 ☐ 515.18 ☐ 515.19 ☐ 515.20 ☐ 515.21 ☐ 515.22 ☐ 515.23 ☐ 515.24 ☐ 515.25 ☐ 515.26 ☐ 515.27 ☐ 515.28 ☐ 515.29 ☐ 515.30 ☐ 515.31 ☐ 515.32 ☐ 515.33 ☐ 515.34 ☐ 515.35 ☐ 515.36 ☐ 515.37 ☐ 515.38 ☐ 515.39 ☐ 515.40 ☐ 515.41 ☐ 515.42 ☐ 515.43 ☐ 515.44 ☐ 515.45 ☐ 515.46 ☐ 515.47 ☐ 515.48 ☐ 515.49 ☐ 515.50 ☐ 515.51 ☐ 515.52 ☐ 515.53 ☐ 515.54 ☐ 515.55 ☐ 515.56 ☐ 515.57 ☐ 515.58 ☐ 515.59 ☐ 515.60 ☐ 515.61 ☐ 515.62 ☐ 515.63 ☐ 515.64 ☐ 515.65 ☐ 515.66 ☐ 515.67 ☐ 515.68 ☐ 515.69 ☐ 515.70 ☐ 515.71 ☐ 515.72 ☐ 515.73 ☐ 515.74 ☐ 515.75 ☐ 515.76 ☐ 515.77 ☐ 515.78 ☐ 515.79 ☐ 515.80 ☐ 515.81 ☐ 515.82 ☐ 515.83 ☐ 515.84 ☐ 515.85 ☐ 515.86 ☐ 515.87 ☐ 515.88 ☐ 515.89 ☐ 515.90 ☐ 515.91 ☐ 515.92 ☐ 515.93 ☐ 515.94 ☐ 515.95 ☐ 515.96 ☐ 515.97 ☐ 515.98 ☐ 515.99 ☐ 515.100

CHAIN-OF-CUSTODY RECORD

Received by: [Signature] Date: 11/10/00 Time: 14:30
 Received by: [Signature] Date: 11/10/00 Time: 14:30
 Received by: [Signature] Date: 11/10/00 Time: 14:30
 Receipt Temperature: 3.4
 Container Count: 13
 Shipping/Airbill Number: 13
 Custody Seal Number: _____

DATA QUALITY OBJECTIVES

Project Specific QC
 Many regulatory programs and EPA methods require Project Specific QC. Project specific QC includes Sample Duplicates, Matrix Spikes, and/or Matrix Spike Duplicates. Laboratory QC is not project specific unless prearranged. Project specific QC samples are charged on a per sample basis. Each MS, MSD and Sample Duplicate requires an additional sample aliquot.
 Project Specific QC Required
☐ Sample Duplicate
☐ Matrix Spike
☐ Matrix Spike Duplicate
 Selection of QC Sample
☐ Please use sample:
☐ Please use sample:
☐ Please use sample:

REMARKS / SPECIAL INSTRUCTIONS

☐ YES ☐ NO MCP Data Certification required.
☐ YES ☐ NO MCP Drinking Water Sample included.
☐ Analyze Duplicates and Trips Blanks only if positive results.
☐ YES ☐ NO CT RCP Data Certification required.
 Signature: _____

Quality Assurance/Quality Control

A. Program Overview

Groundwater Analytical conducts an active Quality Assurance program to ensure the production of high quality, valid data. This program closely follows the guidance provided by *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, US EPA QAMS-005/80 (1980), and *Test Methods for Evaluating Solid Waste*, US EPA, SW-846, Update III (1996).

Quality Control protocols include written Standard Operating Procedures (SOPs) developed for each analytical method. SOPs are derived from US EPA methodologies and other established references. Standards are prepared from commercially obtained reference materials of certified purity, and documented for traceability.

Quality Assessment protocols for most organic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. All samples, standards, blanks, laboratory control samples, matrix spikes and sample duplicates are spiked with internal standards and surrogate compounds. All instrument sequences begin with an initial calibration verification standard and a blank; and excepting GC/MS sequences, all sequences close with a continuing calibration standard. GC/MS systems are tuned to appropriate ion abundance criteria daily, or for each 12 hour operating period, whichever is more frequent.

Quality Assessment protocols for most inorganic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. Standard curves are derived from one reagent blank and four concentration levels. Curve validity is verified by standard recoveries within plus or minus ten percent of the curve.

B. Definitions

Batches are used as the basic unit for Quality Assessment. A Batch is defined as twenty or fewer samples of the same matrix which are prepared together for the same analysis, using the same lots of reagents and the same techniques or manipulations, all within the same continuum of time, up to but not exceeding 24 hours.

Laboratory Control Samples are used to assess the accuracy of the analytical method. A Laboratory Control Sample consists of reagent water or sodium sulfate spiked with a group of target analytes representative of the method analytes. Accuracy is defined as the degree of agreement of the measured value with the true or expected value. Percent Recoveries for the Laboratory Control Samples are calculated to assess accuracy.

Method Blanks are used to assess the level of contamination present in the analytical system. Method Blanks consist of reagent water or an aliquot of sodium sulfate. Method Blanks are taken through all the appropriate steps of an analytical method. Sample data reported is not corrected for blank contamination.

Surrogate Compounds are used to assess the effectiveness of an analytical method in dealing with each sample matrix. Surrogate Compounds are organic compounds which are similar to the target analytes of interest in chemical behavior, but which are not normally found in environmental samples. Percent Recoveries are calculated for each Surrogate Compound.

Quality Control Report Laboratory Control Samples

Category: EPA Method 8260B TCL
QC Batch ID: VM10-1231-W
Matrix: Aqueous
Units: ug/L

LCS
Instrument ID: MS-10 HP 6890
Analyzed: 02-03-11 06:45
Analyst: LMG

LCSD
Instrument ID: MS-10 HP 6890
Analyzed: 02-03-11 07:07
Analyst: LMG

CAS Number	Analyte	LCS			LCS Duplicate				QC Limits	
		Spiked	Measured	Recovery	Spiked	Measured	Recovery	RPD	Spike	RPD
74-87-3	Chloromethane	10	8.6	86 %	10	8.0	80 %	7 %	70 - 130 %	20%
75-01-4	Vinyl Chloride	10	9.6	96 %	10	8.9	89 %	7 %	70 - 130 %	20%
74-83-9	Bromomethane	10	10	105 %	10	10	100 %	4 %	70 - 130 %	20%
75-00-3	Chloroethane	10	9.5	95 %	10	9.1	91 %	5 %	70 - 130 %	20%
75-35-4	1,1-Dichloroethene	10	10	101 %	10	9.7	97 %	4 %	70 - 130 %	20%
67-64-1	Acetone	20	17	86 %	20	16	81 %	7 %	70 - 130 %	20%
75-15-0	Carbon Disulfide	20	23	116 %	20	22	109 %	6 %	70 - 130 %	20%
75-09-2	Methylene Chloride	10	10	104 %	10	9.7	97 %	6 %	70 - 130 %	20%
156-60-5	trans- 1,2-Dichloroethene	10	10	105 %	10	10	100 %	5 %	70 - 130 %	20%
1634-04-4	Methyl tert- butyl Ether (MTBE)	10	9.8	98 %	10	9.6	96 %	2 %	70 - 130 %	20%
75-34-3	1,1-Dichloroethane	10	9.6	96 %	10	9.2	92 %	4 %	70 - 130 %	20%
156-59-2	cis- 1,2-Dichloroethene	10	11	108 %	10	10	103 %	4 %	70 - 130 %	20%
78-93-3	2-Butanone (MEK)	20	18	91 %	20	18	88 %	3 %	70 - 130 %	20%
67-66-3	Chloroform	10	9.8	98 %	10	9.8	98 %	0 %	70 - 130 %	20%
71-55-6	1,1,1-Trichloroethane	10	11	111 %	10	11	107 %	4 %	70 - 130 %	20%
56-23-5	Carbon Tetrachloride	10	12	116 %	10	11	109 %	6 %	70 - 130 %	20%
71-43-2	Benzene	10	10	100 %	10	9.6	96 %	4 %	70 - 130 %	20%
107-06-2	1,2-Dichloroethane	10	9.5	95 %	10	9.1	91 %	4 %	70 - 130 %	20%
79-01-6	Trichloroethene	10	10	100 %	10	9.5	95 %	5 %	70 - 130 %	20%
78-87-5	1,2-Dichloropropane	10	9.7	97 %	10	9.3	93 %	4 %	70 - 130 %	20%
75-27-4	Bromodichloromethane	10	10	100 %	10	9.6	96 %	4 %	70 - 130 %	20%
10061-01-5	cis- 1,3-Dichloropropene	10	9.3	93 %	10	8.8	88 %	5 %	70 - 130 %	20%
108-10-1	4-Methyl-2-Pentanone (MIBK)	20	20	98 %	20	19	95 %	3 %	70 - 130 %	20%
108-88-3	Toluene	10	10	104 %	10	9.9	99 %	5 %	70 - 130 %	20%
10061-02-6	trans- 1,3-Dichloropropene	10	9.1	91 %	10	8.9	89 %	2 %	70 - 130 %	20%
79-00-5	1,1,2-Trichloroethane	10	9.9	99 %	10	10	100 %	1 %	70 - 130 %	20%
127-18-4	Tetrachloroethene	10	12	124 %	10	12	121 %	2 %	70 - 130 %	20%
591-78-6	2-Hexanone	20	20	102 %	20	19	96 %	7 %	70 - 130 %	20%
124-48-1	Dibromochloromethane	10	12	117 %	10	11	111 %	5 %	70 - 130 %	20%
108-90-7	Chlorobenzene	10	10	104 %	10	10	102 %	2 %	70 - 130 %	20%
100-41-4	Ethylbenzene	10	10	105 %	10	10	104 %	1 %	70 - 130 %	20%
108-38-3/106-42-3	meta- Xylene and para- Xylene	20	22	110 %	20	22	108 %	2 %	70 - 130 %	20%
95-47-6	ortho- Xylene	10	11	108 %	10	11	107 %	2 %	70 - 130 %	20%
100-42-5	Styrene	10	11	106 %	10	10	103 %	3 %	70 - 130 %	20%
75-25-2	Bromoform	10	11	107 %	10	10	104 %	3 %	70 - 130 %	20%
79-34-5	1,1,2,2-Tetrachloroethane	10	10	100 %	10	10	101 %	1 %	70 - 130 %	20%

QC Surrogate Compound	Spiked	Measured	Recovery	Spiked	Measured	Recovery	QC Limits
Dibromofluoromethane	10	11	113 %	10	11	112 %	70 - 130 %
1,2-Dichloroethane-d ₄	10	11	109 %	10	10	103 %	70 - 130 %
Toluene-d ₈	10	11	112 %	10	11	109 %	70 - 130 %
4-Bromofluorobenzene	10	10	103 %	10	10	103 %	70 - 130 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Sample preparation performed by EPA Method 5030B.

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

Quality Control Report Method Blank

Category: EPA Method 8260B TCL
QC Batch ID: VM10-1231-W
Matrix: Aqueous

Instrument ID: MS-10 HP 6890
Analyzed: 02-03-11 07:30
Analyst: LMG

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
74-87-3	Chloromethane	BRL		ug/L	0.5
75-01-4	Vinyl Chloride	BRL		ug/L	0.5
74-83-9	Bromomethane	BRL		ug/L	0.5
75-00-3	Chloroethane	BRL		ug/L	0.5
75-35-4	1,1-Dichloroethene	BRL		ug/L	0.5
67-64-1	Acetone	BRL		ug/L	10
75-15-0	Carbon Disulfide	BRL		ug/L	5
75-09-2	Methylene Chloride	BRL		ug/L	3
156-60-5	trans- 1,2-Dichloroethene	BRL		ug/L	0.5
1634-04-4	Methyl tert- butyl Ether (MTBE)	BRL		ug/L	0.5
75-34-3	1,1-Dichloroethane	BRL		ug/L	0.5
156-59-2	cis- 1,2-Dichloroethene	BRL		ug/L	0.5
78-93-3	2-Butanone (MEK)	BRL		ug/L	5
67-66-3	Chloroform	BRL		ug/L	0.5
71-55-6	1,1,1-Trichloroethane	BRL		ug/L	0.5
56-23-5	Carbon Tetrachloride	BRL		ug/L	0.5
71-43-2	Benzene	BRL		ug/L	0.5
107-06-2	1,2-Dichloroethane	BRL		ug/L	0.5
79-01-6	Trichloroethene	BRL		ug/L	0.5
78-87-5	1,2-Dichloropropane	BRL		ug/L	0.5
75-27-4	Bromodichloromethane	BRL		ug/L	0.5
10061-01-5	cis- 1,3-Dichloropropene	BRL		ug/L	0.4
108-10-1	4-Methyl-2-Pentanone (MIBK)	BRL		ug/L	5
108-88-3	Toluene	BRL		ug/L	0.5
10061-02-6	trans- 1,3-Dichloropropene	BRL		ug/L	0.4
79-00-5	1,1,2-Trichloroethane	BRL		ug/L	0.5
127-18-4	Tetrachloroethene	BRL		ug/L	0.5
591-78-6	2-Hexanone	BRL		ug/L	5
124-48-1	Dibromochloromethane	BRL		ug/L	0.5
108-90-7	Chlorobenzene	BRL		ug/L	0.5
100-41-4	Ethylbenzene	BRL		ug/L	0.5
108-38-3/106-42-3	meta- Xylene and para- Xylene	BRL		ug/L	0.5
95-47-6	ortho- Xylene	BRL		ug/L	0.5
100-42-5	Styrene	BRL		ug/L	0.5
75-25-2	Bromoform	BRL		ug/L	0.5
79-34-5	1,1,2,2-Tetrachloroethane	BRL		ug/L	0.5

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
Dibromofluoromethane	10	11	115 %	70 - 130 %
1,2-Dichloroethane-d ₄	10	11	114 %	70 - 130 %
Toluene-d ₈	10	11	115 %	70 - 130 %
4-Bromofluorobenzene	10	10	100 %	70 - 130 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Sample preparation performed by EPA Method 5030B.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

Certifications and Approvals

Groundwater Analytical maintains environmental laboratory certification in a variety of states.

Copies of our current certificates may be obtained from our website:

<http://www.groundwateranalytical.com/qualifications.htm>

CONNECTICUT

Department of Health Services, PH-0586

Potable Water, Wastewater, Solid Waste and Soil

http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/Out_State.pdf

MASSACHUSETTS

Department of Environmental Protection, M-MA-103

Potable Water and Non-Potable Water

<http://public.dep.state.ma.us/labcert/labcert.aspx>

Department of Labor,

Asbestos Analytical Services, Class A

Division of Occupational Safety, AA000195

http://www.mass.gov/dos/forms/la-rpt_list_aa.pdf

NEW HAMPSHIRE

Department of Environmental Services, 202708

Potable Water, Non-Potable Water, Solid and Chemical Materials

<http://www4.egov.nh.gov/DES/NHELAP>

NEW YORK

Department of Health, 11754

Potable Water, Non-Potable Water, Solid and Hazardous Waste

<http://www.wadsworth.org/labcert/elap/comm.html>

RHODE ISLAND

Department of Health,

Potable and Non-Potable Water Microbiology, Organic and Inorganic Chemistry

Division of Laboratories, LAO00054

<http://www.health.ri.gov/labs/outofstatelabs.pdf>

U.S. DEPARTMENT OF AGRICULTURE

USDA, Soil Permit, S-53921

Foreign soil import permit

VERMONT

Department of Health, VT-87643

Potable Water

http://healthvermont.gov/enviro/ph_lab/water_test.aspx#cert

Certifications and Approvals

MASSACHUSETTS
Department of Environmental Protection, M-MA-103

Groundwater Analytical maintains MassDEP environmental laboratory certification for only the methods and analytes listed below. Analyses for certified analytes are conducted in accordance with MassDEP certification standards, except as may be specifically noted in the project narrative.

Potable Water (Drinking Water)		Non-Potable Water (Wastewater)	
Analyte	Method	Analyte	Method
1,2-Dibromo-3-Chloropropane	EPA 504.1	Aluminum	EPA 200.8
1,2-Dibromoethane	EPA 504.1	Ammonia-N	Lachat 10-107-06-1-B
Alkalinity, Total	SM 2320-B	Antimony	EPA 200.7
Antimony	EPA 200.8	Antimony	EPA 200.8
Arsenic	EPA 200.8	Arsenic	EPA 200.7
Barium	EPA 200.7	Arsenic	EPA 200.8
Barium	EPA 200.8	Beryllium	EPA 200.7
Beryllium	EPA 200.7	Beryllium	EPA 200.8
Beryllium	EPA 200.8	Beta-BHC	EPA 608
Cadmium	EPA 200.7	Biochemical Oxygen Demand	SM 5210-B
Cadmium	EPA 200.8	Cadmium	EPA 200.7
Calcium	EPA 200.7	Cadmium	EPA 200.8
Chlorine, Residual Free	SM 4500-CL-G	Calcium	EPA 200.7
Chromium	EPA 200.7	Chemical Oxygen Demand	SM 5220-D
Copper	EPA 200.7	Chlordane	EPA 608
Copper	EPA 200.8	Chloride	EPA 300.0
Cyanide, Total	Lachat 10-204-00-1-A	Chlorine, Total Residual	SM 4500-CL-G
E. Coli (Treatment and Distribution)	Enz. Sub. SM 9223	Chromium	EPA 200.7
E. Coli (Treatment and Distribution)	NA-MUG SM 9222-G	Chromium	EPA 200.8
Fecal Coliform (Source Water)	MF SM 9222-D	Cobalt	EPA 200.7
Fluoride	EPA 300.0	Cobalt	EPA 200.8
Fluoride	SM 4500-F-C	Copper	EPA 200.7
Haloacetic Acids	EPA 552.2	Copper	EPA 200.8
Heterotrophic Plate Count	SM 9215-B	Cyanide, Total	Lachat 10-204-00-1-A
Lead	EPA 200.8	DDD	EPA 608
Mercury	EPA 245.1	DDE	EPA 608
Nickel	EPA 200.7	DDT	EPA 608
Nickel	EPA 200.8	Delta-BHC	EPA 608
Nitrate-N	EPA 300.0	Dieldrin	EPA 608
Nitrate-N	Lachat 10-107-04-1-C	Endosulfan I	EPA 608
Nitrite-N	EPA 300.0	Endosulfan II	EPA 608
Nitrite-N	Lachat 10-107-04-1-C	Endosulfan Sulfate	EPA 608
pH	SM 4500-H-B	Endrin	EPA 608
Selenium	EPA 200.8	Endrin Aldehyde	EPA 608
Silver	EPA 200.7	Gamma-BHC	EPA 608
Silver	EPA 200.8	Hardness (CaCO ₃), Total	EPA 200.7
Sodium	EPA 200.7	Hardness (CaCO ₃), Total	SM 2340-B
Sulfate	EPA 300.0	Heptachlor	EPA 608
Thallium	EPA 200.8	Heptachlor Epoxide	EPA 608
Total Coliform (Treatment and Distribution)	Enz. Sub. SM 9223	Iron	EPA 200.7
Total Coliform (Treatment and Distribution)	MF SM 9222-B	Kjeldahl-N	Lachat 10-107-06-02-D
Total Dissolved Solids	SM 2540-C	Lead	EPA 200.7
Trihalomethanes	EPA 524.2	Magnesium	EPA 200.7
Turbidity	SM 2130-B	Manganese	EPA 200.7
Volatile Organic Compounds	EPA 524.2	Manganese	EPA 200.8
Non-Potable Water (Wastewater)		Mercury	EPA 245.1
Analyte	Method	Molybdenum	EPA 200.7
Aldrin	EPA 608	Molybdenum	EPA 200.8
Alkalinity, Total	SM 2320-B	Nickel	EPA 200.7
Alpha-BHC	EPA 608	Nickel	EPA 200.8
Aluminum	EPA 200.7	Nitrate-N	EPA 300.0
		Nitrate-N	Lachat 10-107-04-1-C
		Non-Filterable Residue	SM 2540-D
		Oil and Grease	EPA 1664

Certifications and Approvals

MASSACHUSETTS**Department of Environmental Protection, M-MA-103**

Groundwater Analytical maintains MassDEP environmental laboratory certification for only the methods and analytes listed below. Analyses for certified analytes are conducted in accordance with MassDEP certification standards, except as may be specifically noted in the project narrative.

Non-Potable Water (Wastewater)

Analyte	Method
Orthophosphate	Lachat 10-115-01-1-A
pH	SM 4500-H-B
Phenolics, Total	EPA 420.4
Phenolics, Total	Lachat 10-210-00-1-B
Phosphorus, Total	Lachat 10-115-01-1-C
Phosphorus, Total	SM 4500-P-B,E
Polychlorinated Biphenyls (Oil)	EPA 600/4-81-045
Polychlorinated Biphenyls (Water)	EPA 608
Potassium	EPA 200.7
Selenium	EPA 200.7
Selenium	EPA 200.8
Silver	EPA 200.7
Sodium	EPA 200.7
Specific Conductivity	SM 2510-B
Strontium	EPA 200.7
Sulfate	EPA 300.0
SVOC-Acid Extractables	EPA 625
SVOC-Base/Neutral Extractables	EPA 625
Thallium	EPA 200.7
Thallium	EPA 200.8
Titanium	EPA 200.7
Total Dissolved Solids	SM 2540-C
Total Organic Carbon	SM 5310-B
Toxaphene	EPA 608
Vanadium	EPA 200.7
Vanadium	EPA 200.8
Volatile Aromatics	EPA 602
Volatile Aromatics	EPA 624
Volatile Halocarbons	EPA 624
Zinc	EPA 200.7
Zinc	EPA 200.8

GROUNDWATER ANALYTICAL

BV

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FAX (508) 759-4475
www.groundwateranalytical.com

February 17, 2011

Mr. David Bennett
Bennett Environmental Associates, Inc.
P.O. Box 1743
Brewster, MA 02631

LABORATORY REPORT

Project: **Town of Harwich/BEA10-10288**
Lab ID: **139472**
Received: **01-31-11**

Dear Dave:

Enclosed are the analytical results for the above referenced project. The project was processed for Priority turnaround.

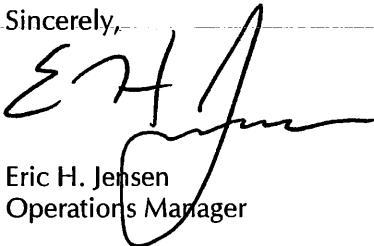
This letter authorizes the release of the analytical results, and should be considered a part of this report. This report contains a sample receipt report detailing the samples received, a project narrative indicating project changes and non-conformances, a quality control report, and a statement of our state certifications.

The analytical results contained in this report meet all applicable NELAC standards, except as may be specifically noted, or described in the project narrative. The analytical results relate only to the samples received. This report may only be used or reproduced in its entirety.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Should you have any questions concerning this report, please do not hesitate to contact me.

Sincerely,



Eric H. Jensen
Operations Manager

EHJ/elm
Enclosures

Sample Receipt Report

Project: **Town of Harwich/BEA10-10288**
Client: **Bennett Environmental Associates, Inc.**
Lab ID: **139472**

Delivery: **GWA Courier**
Airbill: **n/a**
Lab Receipt: **01-31-11**

Temperature: **3.4°C**
Chain of Custody: **Present**
Custody Seal(s): **n/a**

Lab ID	Field ID		Matrix	Sampled	Method				Notes
139472-1	BEA-1S		Aqueous	1/28/11 13:00	EPA 8260B TCL Volatile Organics				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C1321054	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		
C1321053	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		
C1321052	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
139472-2	BEA-1D		Aqueous	1/28/11 12:30	EPA 8260B TCL Volatile Organics				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C1321051	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		
C1321041	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		
C1321031	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
139472-3	MW-1		Aqueous	1/28/11 15:00	EPA 8260B TCL Volatile Organics				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C1313590	40 mL VOA Vial	n/a	n/a	HCL	n/a	n/a	n/a		
C1313591	40 mL VOA Vial	n/a	n/a	HCL	n/a	n/a	n/a		
C1313592	40 mL VOA Vial	n/a	n/a	HCL	n/a	n/a	n/a		

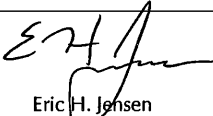
Lab ID	Field ID		Matrix	Sampled	Method				Notes
139472-4	MW-5		Aqueous	1/28/11 14:15	EPA 8260B TCL Volatile Organics				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C1321050	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		
C1321040	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		
C1321030	40 mL VOA Vial	Proline	BX38028	HCL	R-5915D	12-02-10	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
139472-5	BEA-1S		Aqueous	1/28/11 13:00	Formaldehyde				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C1293048	1 L Amber Glass	Proline	BX37804	None	n/a	n/a	n/a		

Data Certification

Project: Town of Harwich/BEA10-10288
Client: Bennett Environmental Associates, Inc.

Lab ID: 139472
Received: 01-31-11 14:40

Mass DEP Analytical Protocol Certification Form					
Project Location: n/a		MA DEP RTN: n/a			
This Form provides certifications for the following data set:					
EPA 8260B: 139472-1,-2,-3,-4					
Sample Matrices: Groundwater/Surface (X) Soil/Sediment () Drinking Water () Air () Other ()					
CAM Protocol (check all that apply below):					
8260 VOC CAM II A (X)	7470/7471 Hg CAM III B ()	Mass DEP VPH CAM IV A ()	8081 Pesticides CAM V B ()	7196 Hex Cr CAM VI B ()	Mass DEP APH CAM IX A ()
8270 SVOC CAM II B ()	7010 Metals CAM III C ()	Mass DEP EPH CAM IV B ()	8151 Herbicides CAM V C ()	8330 Explosives CAM VIII A ()	TO-15 VOC CAM IX B ()
6010 Metals CAM III A ()	6020 Metals CAM III D ()	8082 PCB CAM V A ()	9012 Cyanide/PAC CAM VI A ()	6860 Perchlorate CAM VIII B ()	
An affirmative response to questions A through F are required for "Presumptive Certainty" status.					
A.	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?				Yes ✓
B.	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?				Yes ✓
C.	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?				Yes ✓
D.	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?				Yes ✓
E.	VPH, EPH and APH methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).				n/a
F.	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?				Yes ✓
Responses to questions G, H and I below are required for "Presumptive Certainty" status.					
G.	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?				No ✓
Data User Note: Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40.1056(2)(k) and WSC-07-350.					
H.	Were all QC performance standards specified in the CAM protocol(s) achieved?				No ✓
I.	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?				No ✓
All negative responses must be addressed in an attached laboratory narrative.					
I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.					
Signature: 		Position: Operations Manager			
Printed Name: Eric H. Jensen		Date: 02-17-11			

data b
negative for
DWA

EPA Method 8260B TCL Volatile Organics by GC/MS

Field ID: **BEA-1S**
Project: **Town of Harwich/BEA10-10288**
Client: **Bennett Environmental Associates, Inc.**

Laboratory ID: **139472-1**
Sampled: **01-28-11 13:00**
Received: **01-31-11 14:40**
Analyzed: **02-03-11 09:33**
Analyst: **LMG**

Matrix: **Aqueous**
Container: **40 mL VOA Vial**
Preservation: **HCl/ Cool**

QC Batch ID: **VM10-1231-W**
Instrument ID: **MS-10 HP 6890**
Sample Volume: **5 mL**
Dilution Factor: **1**

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
74-87-3	Chloromethane	BRL		ug/L	0.5
75-01-4	Vinyl Chloride	BRL		ug/L	0.5
74-83-9	Bromomethane	BRL		ug/L	0.5
75-00-3	Chloroethane	BRL		ug/L	0.5
75-35-4	1,1-Dichloroethene	BRL		ug/L	0.5
67-64-1	Acetone	BRL		ug/L	10
75-15-0	Carbon Disulfide	BRL		ug/L	5
75-09-2	Methylene Chloride	BRL		ug/L	3
156-60-5	trans- 1,2-Dichloroethene	BRL		ug/L	0.5
1634-04-4	Methyl tert- butyl Ether (MTBE)	BRL		ug/L	0.5
75-34-3	1,1-Dichloroethane	BRL		ug/L	0.5
156-59-2	cis- 1,2-Dichloroethene	BRL		ug/L	0.5
78-93-3	2-Butanone (MEK)	BRL		ug/L	5
67-66-3	Chloroform	BRL		ug/L	0.5
71-55-6	1,1,1-Trichloroethane	BRL		ug/L	0.5
56-23-5	Carbon Tetrachloride	BRL		ug/L	0.5
71-43-2	Benzene	BRL		ug/L	0.5
107-06-2	1,2-Dichloroethane	BRL		ug/L	0.5
79-01-6	Trichloroethene	BRL		ug/L	0.5
78-87-5	1,2-Dichloropropane	BRL		ug/L	0.5
75-27-4	Bromodichloromethane	BRL		ug/L	0.5
10061-01-5	cis- 1,3-Dichloropropene	BRL		ug/L	0.4
108-10-1	4-Methyl-2-Pentanone (MIBK)	BRL		ug/L	5
108-88-3	Toluene	BRL		ug/L	0.5
10061-02-6	trans- 1,3-Dichloropropene	BRL		ug/L	0.4
79-00-5	1,1,2-Trichloroethane	BRL		ug/L	0.5
127-18-4	Tetrachloroethene	BRL		ug/L	0.5
591-78-6	2-Hexanone	BRL		ug/L	5
124-48-1	Dibromochloromethane	BRL		ug/L	0.5
108-90-7	Chlorobenzene	BRL		ug/L	0.5
100-41-4	Ethylbenzene	BRL		ug/L	0.5
108-38-3/106-42-3	meta- Xylene and para- Xylene	BRL		ug/L	0.5
95-47-6	ortho- Xylene	BRL		ug/L	0.5
100-42-5	Styrene	BRL		ug/L	0.5
75-25-2	Bromoform	BRL		ug/L	0.5
79-34-5	1,1,2,2-Tetrachloroethane	BRL		ug/L	0.5

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
Dibromofluoromethane	10	11	113 %	70 - 130 %
1,2-Dichloroethane-d ₄	10	11	112 %	70 - 130 %
Toluene-d ₈	10	11	114 %	70 - 130 %
4-Bromofluorobenzene	10	10	100 %	70 - 130 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Sample preparation performed by EPA Method 5030B.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

**EPA Method 8260B
TCL Volatile Organics by GC/MS**

Field ID: **BEA-1D**
Project: **Town of Harwich/BEA10-10288**
Client: **Bennett Environmental Associates, Inc.**

Laboratory ID: **139472-2**
Sampled: **01-28-11 12:30**
Received: **01-31-11 14:40**
Analyzed: **02-03-11 09:55**
Analyst: **LMG**

Matrix: **Aqueous**
Container: **40 mL VOA Vial**
Preservation: **HCl/ Cool**

QC Batch ID: **VM10-1231-W**
Instrument ID: **MS-10 HP 6890**
Sample Volume: **5 mL**
Dilution Factor: **5**

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
74-87-3	Chloromethane	BRL		ug/L	3
75-01-4	Vinyl Chloride	BRL		ug/L	3
74-83-9	Bromomethane	BRL		ug/L	3
75-00-3	Chloroethane	BRL		ug/L	3
75-35-4	1,1-Dichloroethene	BRL		ug/L	3
67-64-1	Acetone	BRL		ug/L	50
75-15-0	Carbon Disulfide	BRL		ug/L	25
75-09-2	Methylene Chloride	BRL		ug/L	13
156-60-5	<i>trans</i> - 1,2-Dichloroethene	BRL		ug/L	3
1634-04-4	Methyl <i>tert</i> - butyl Ether (MTBE)	BRL		ug/L	3
75-34-3	1,1-Dichloroethane	BRL		ug/L	3
156-59-2	<i>cis</i> - 1,2-Dichloroethene	20		ug/L	3
78-93-3	2-Butanone (MEK)	BRL		ug/L	25
67-66-3	Chloroform	BRL		ug/L	3
71-55-6	1,1,1-Trichloroethane	BRL		ug/L	3
56-23-5	Carbon Tetrachloride	BRL		ug/L	3
71-43-2	Benzene	BRL		ug/L	3
107-06-2	1,2-Dichloroethane	BRL		ug/L	3
79-01-6	Trichloroethene	25		ug/L	3
78-87-5	1,2-Dichloropropane	BRL		ug/L	3
75-27-4	Bromodichloromethane	BRL		ug/L	3
10061-01-5	<i>cis</i> - 1,3-Dichloropropene	BRL		ug/L	2
108-10-1	4-Methyl-2-Pentanone (MIBK)	BRL		ug/L	25
108-88-3	Toluene	BRL		ug/L	3
10061-02-6	<i>trans</i> - 1,3-Dichloropropene	BRL		ug/L	2
79-00-5	1,1,2-Trichloroethane	BRL		ug/L	3
127-18-4	Tetrachloroethene	260		ug/L	3
591-78-6	2-Hexanone	BRL		ug/L	25
124-48-1	Dibromochloromethane	BRL		ug/L	3
108-90-7	Chlorobenzene	BRL		ug/L	3
100-41-4	Ethylbenzene	BRL		ug/L	3
108-38-3/106-42-3	<i>meta</i> - Xylene and <i>para</i> - Xylene	BRL		ug/L	3
95-47-6	<i>ortho</i> - Xylene	BRL		ug/L	3
100-42-5	Styrene	BRL		ug/L	3
75-25-2	Bromoform	BRL		ug/L	3
79-34-5	1,1,2,2-Tetrachloroethane	BRL		ug/L	3

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
Dibromofluoromethane	10	11	113 %	70 - 130 %
1,2-Dichloroethane-d ₄	10	11	112 %	70 - 130 %
Toluene-d ₈	10	11	115 %	70 - 130 %
4-Bromofluorobenzene	10	10	101 %	70 - 130 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Sample preparation performed by EPA Method 5030B.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

**EPA Method 8260B
TCL Volatile Organics by GC/MS**

Field ID: **MW-1**
Project: **Town of Harwich/BEA10-10288**
Client: **Bennett Environmental Associates, Inc.**

Laboratory ID: **139472-3**
Sampled: **01-28-11 15:00**
Received: **01-31-11 14:40**
Analyzed: **02-03-11 10:18**
Analyst: **LMG**

Matrix: **Aqueous**
Container: **40 mL VOA Vial**
Preservation: **HCl/ Cool**

QC Batch ID: **VM10-1231-W**
Instrument ID: **MS-10 HP 6890**
Sample Volume: **5 mL**
Dilution Factor: **1**

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
74-87-3	Chloromethane	BRL		ug/L	0.5
75-01-4	Vinyl Chloride	BRL		ug/L	0.5
74-83-9	Bromomethane	BRL		ug/L	0.5
75-00-3	Chloroethane	BRL		ug/L	0.5
75-35-4	1,1-Dichloroethene	BRL		ug/L	0.5
67-64-1	Acetone	BRL		ug/L	10
75-15-0	Carbon Disulfide	BRL		ug/L	5
75-09-2	Methylene Chloride	BRL		ug/L	3
156-60-5	<i>trans</i> -1,2-Dichloroethene	BRL		ug/L	0.5
1634-04-4	Methyl <i>tert</i> -butyl Ether (MTBE)	BRL		ug/L	0.5
75-34-3	1,1-Dichloroethane	BRL		ug/L	0.5
156-59-2	<i>cis</i> -1,2-Dichloroethene	0.5		ug/L	0.5
78-93-3	2-Butanone (MEK)	BRL		ug/L	5
67-66-3	Chloroform	BRL		ug/L	0.5
71-55-6	1,1,1-Trichloroethane	BRL		ug/L	0.5
56-23-5	Carbon Tetrachloride	BRL		ug/L	0.5
71-43-2	Benzene	BRL		ug/L	0.5
107-06-2	1,2-Dichloroethane	BRL		ug/L	0.5
79-01-6	Trichloroethene	0.5		ug/L	0.5
78-87-5	1,2-Dichloropropane	BRL		ug/L	0.5
75-27-4	Bromodichloromethane	BRL		ug/L	0.5
10061-01-5	<i>cis</i> -1,3-Dichloropropene	BRL		ug/L	0.4
108-10-1	4-Methyl-2-Pentanone (MIBK)	BRL		ug/L	5
108-88-3	Toluene	BRL		ug/L	0.5
10061-02-6	<i>trans</i> -1,3-Dichloropropene	BRL		ug/L	0.4
79-00-5	1,1,2-Trichloroethane	BRL		ug/L	0.5
127-18-4	Tetrachloroethene	9		ug/L	0.5
591-78-6	2-Hexanone	BRL		ug/L	5
124-48-1	Dibromochloromethane	BRL		ug/L	0.5
108-90-7	Chlorobenzene	BRL		ug/L	0.5
100-41-4	Ethylbenzene	BRL		ug/L	0.5
108-38-3/106-42-3	<i>meta</i> -Xylene and <i>para</i> -Xylene	BRL		ug/L	0.5
95-47-6	<i>ortho</i> -Xylene	BRL		ug/L	0.5
100-42-5	Styrene	BRL		ug/L	0.5
75-25-2	Bromoform	BRL		ug/L	0.5
79-34-5	1,1,2,2-Tetrachloroethane	BRL		ug/L	0.5

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
Dibromofluoromethane	10	12	117 %	70 - 130 %
1,2-Dichloroethane-d ₄	10	11	114 %	70 - 130 %
Toluene-d ₈	10	11	113 %	70 - 130 %
4-Bromofluorobenzene	10	10	99 %	70 - 130 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Sample preparation performed by EPA Method 5030B.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

**EPA Method 8260B
TCL Volatile Organics by GC/MS**

Field ID: MW-5
Project: Town of Harwich/BEA10-10288
Client: Bennett Environmental Associates, Inc.

Laboratory ID: 139472-4
Sampled: 01-28-11 14:15
Received: 01-31-11 14:40
Analyzed: 02-03-11 10:40
Analyst: LMG

Matrix: Aqueous
Container: 40 mL VOA Vial
Preservation: HCl/ Cool

QC Batch ID: VM10-1231-W
Instrument ID: MS-10 HP 6890
Sample Volume: 5 mL
Dilution Factor: 1

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
74-87-3	Chloromethane	BRL		ug/L	0.5
75-01-4	Vinyl Chloride	BRL		ug/L	0.5
74-83-9	Bromomethane	BRL		ug/L	0.5
75-00-3	Chloroethane	BRL		ug/L	0.5
75-35-4	1,1-Dichloroethene	BRL		ug/L	0.5
67-64-1	Acetone	BRL		ug/L	10
75-15-0	Carbon Disulfide	BRL		ug/L	5
75-09-2	Methylene Chloride	BRL		ug/L	3
156-60-5	trans- 1,2-Dichloroethene	BRL		ug/L	0.5
1634-04-4	Methyl tert- butyl Ether (MTBE)	BRL		ug/L	0.5
75-34-3	1,1-Dichloroethane	BRL		ug/L	0.5
156-59-2	cis- 1,2-Dichloroethene	BRL		ug/L	0.5
78-93-3	2-Butanone (MEK)	BRL		ug/L	5
67-66-3	Chloroform	BRL		ug/L	0.5
71-55-6	1,1,1-Trichloroethane	BRL		ug/L	0.5
56-23-5	Carbon Tetrachloride	BRL		ug/L	0.5
71-43-2	Benzene	BRL		ug/L	0.5
107-06-2	1,2-Dichloroethane	BRL		ug/L	0.5
79-01-6	Trichloroethene	BRL		ug/L	0.5
78-87-5	1,2-Dichloropropane	BRL		ug/L	0.5
75-27-4	Bromodichloromethane	BRL		ug/L	0.5
10061-01-5	cis- 1,3-Dichloropropene	BRL		ug/L	0.4
108-10-1	4-Methyl-2-Pentanone (MIBK)	BRL		ug/L	5
108-88-3	Toluene	BRL		ug/L	0.5
10061-02-6	trans- 1,3-Dichloropropene	BRL		ug/L	0.4
79-00-5	1,1,2-Trichloroethane	BRL		ug/L	0.5
127-18-4	Tetrachloroethene	BRL		ug/L	0.5
591-78-6	2-Hexanone	BRL		ug/L	5
124-48-1	Dibromochloromethane	BRL		ug/L	0.5
108-90-7	Chlorobenzene	BRL		ug/L	0.5
100-41-4	Ethylbenzene	BRL		ug/L	0.5
108-38-3/106-42-3	meta- Xylene and para- Xylene	BRL		ug/L	0.5
95-47-6	ortho- Xylene	BRL		ug/L	0.5
100-42-5	Styrene	BRL		ug/L	0.5
75-25-2	Bromoform	BRL		ug/L	0.5
79-34-5	1,1,2,2-Tetrachloroethane	BRL		ug/L	0.5

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
Dibromofluoromethane	10	12	116 %	70 - 130 %
1,2-Dichloroethane-d ₄	10	12	115 %	70 - 130 %
Toluene-d ₈	10	11	114 %	70 - 130 %
4-Bromofluorobenzene	10	10	98 %	70 - 130 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Sample preparation performed by EPA Method 5030B.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

Analysis Report

February 11, 2011

FOR: Attn: Mr. Eric Jensen
Groundwater Analytical
P.O. Box 1200
Buzzards Bay, MA 02532-1200Sample InformationMatrix: GROUND WATER
Location Code: GROUND
Rush Request: RUSH##
P.O.#:Custody InformationCollected by:
Received by: LB
Analyzed by: see "By" belowDate Time01/28/11 13:00
02/02/11 13:46Laboratory DataSDG ID: GAZ99829
Phoenix ID: AZ99829

Project ID: 139472

Client ID: BEA-1S

Parameter	Result	RL	Units	Date	Time	By	Reference
Formaldehyde Prep for HPLC	Completed			02/08/11		EW/R/D	
Formaldehyde	ND	100	ug/L	02/09/11		JH	SW8315 1.7

1 = This parameter is not certified by NY NELAC for this matrix. NY NELAC does not offer certification for all parameters.

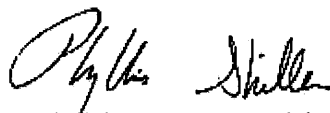
7 = This parameter is not certified by MA for this matrix.

Comments:

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

ND=Not detected BDL=Below Detection Level RL=Reporting Level

This report must not be reproduced except in full as defined by the attached chain of custody.



Phyllis Shiller, Laboratory Director

February 11, 2011

Project Narrative

Project: **Town of Harwich/BEA10-10288**
Client: **Bennett Environmental Associates, Inc.**

Lab ID: **139472**
Received: **01-31-11 14:40**

A. Documentation and Client Communication

The following documentation discrepancies, and client changes or amendments were noted for this project:

1. No documentation discrepancies, changes, or amendments were noted.

B. Method Modifications, Non-Conformances and Observations

The sample(s) in this project were analyzed by the references analytical method(s), and no method modifications, non-conformances or analytical issues were noted, except as indicated below:

1. EPA 8260B Note: Sample 139472-2. Sample was diluted prior to analysis. Dilution was required to keep all target analytes within calibration. Elevated reporting limits are above the recommended CAM reporting limits for the target analytes.
2. EPA 8260B Note: Samples 139472-1 through -4. Samples were analyzed for only selected target analytes, as requested by client.
3. EPA 8260B Note: Samples 139472-1 through -4. Acetone did not meet the required minimum average response factor in the ICAL. Response factor was below the recommended limit in the CCV.
4. EPA 8260B Note: Samples 139472-1 through -4. Relative percent deviation for Tetrachloroethene was above the recommended limit in the CCV.

*TEL of screening
under ASTM E84.
Based on historic
COLS*

GROUNDWATER ANALYTICAL

228 Main Street, P.O. Box 1200
Buzzards Bay, MA 02532
Telephone (508) 759-4441 • FAX (508) 759-4475
www.groundwateranalytical.com

CHAIN-OF-CUSTODY RECORD AND WORK ORDER

Project Name: **Town of Harwich**
 Project Number: **BEA10-10280**
 Sampler Name: **STW/DCB**
 Project Manager: **David Bennett**

Firm: **Bennett Environmental Assoc.**
 Address: **1573 Main St./P.O. Box 1743**
 City / State / Zip: **Brewster, MA 02631**
 Telephone: **(508) 896-1706**

TURNAROUND
☒ STANDARD (10 Business Days)
☒ PRIORITY (5 Business Days)
☐ RUSH (RAN)
 (Rush requires Rush Authentication Number)

Analysis Request
☒ Please Email to: **DBennett@bennett-ea.com**
☐ Please FAX to: _____

BILLING
 Purchase Order No.: **10280**
☒ Third Party Billing
☐ GWA Quote: _____

INSTRUCTIONS: Use separate line for each container (except replicates).

DATE	TIME	SAMPLE IDENTIFICATION	Matrix		Containers		Preservation		LABORATORY NUMBER (Lab Use Only)
			GROUNDWATER	OTHER SOLID	TYPE	NUMBER	TEMPERATURE	TIME	
10/31/10	1:00	BEA-1S	X		COMPOSITE	GRAV	X3X		
11/01/10	1:00	BEA-1S	X		COMPOSITE	GRAV	X3X		
12/30/10	12:30	BEA-1D	X		COMPOSITE	GRAV	X3X		
3/20/11	3:20	MW-1	X		COMPOSITE	GRAV	X3X		
2/15/11	2:15	MW-5	X		COMPOSITE	GRAV	X3X		

ANALYSIS REQUEST

Parameter	Unit	Method	Notes
Ammonia Nitrogen (NH3-N)	mg/L	4500-NH3	
Ammonium Nitrogen (NH4-N)	mg/L	4500-NH4	
Calcium	mg/L	4500-Ca	
Chloride	mg/L	4500-Cl	
Copper	mg/L	4500-Cu	
Fluoride	mg/L	4500-F	
Iron	mg/L	4500-Fe	
Magnesium	mg/L	4500-Mg	
Manganese	mg/L	4500-Mn	
Nitrate Nitrogen (NO3-N)	mg/L	4500-NO3	
Nitrite Nitrogen (NO2-N)	mg/L	4500-NO2	
Phosphate	mg/L	4500-P	
Sulfate	mg/L	4500-SO4	
Sulfide	mg/L	4500-S	
Total Dissolved Solids (TDS)	mg/L	4500-TDS	
Total Suspended Solids (TSS)	mg/L	4500-TSS	
Zinc	mg/L	4500-Zn	

DATA QUALITY OBJECTIVES

Regulatory Program
 State: ☐ CT ☐ ME ☐ MA ☐ NH ☐ NY ☐ RI ☐ VT
 Standard: ☐ MGP GW-1S-1 ☐ MGP GW-2S-2 ☐ NY STARS ☐ Drinking Water ☐ Wastewater ☐ Waste Disposal ☐ Dredge Material

Project Specific OC
 Many regulatory programs and EPA methods require Project specific OC. Project specific OC includes Sample Duplicates, Matrix Spikes, and/or Matrix Spike Duplicates. Laboratory OC is not project specific unless prearranged. Project specific OC samples are charged on a per sample basis. Each MS, MSD and Sample Duplicate requires an additional sample aliquot.

Selection of OC Sample
☐ Sample Duplicate
☐ Matrix Spike
☐ Matrix Spike Duplicate

REMARKS / SPECIAL INSTRUCTIONS

☐ YES ☐ NO MCP Data Certification required.
☐ YES ☐ NO MCP Drinking Water Sample included.
 (Volatile analyses require duplicate collection and Trip Blanks)
☐ Analyze Duplicates and Trip Blanks only if positive results.
☐ YES ☐ NO CT RCP Data Certification required.
 Signature: _____

CHAIN-OF-CUSTODY RECORD

Relinquished to: **11/11/10** Date
 Received by: **11/11/10** Date
 Relinquished by: **11/11/10** Date
 Received by: **11/11/10** Date

Method of Shipment: ☒ GWA Courier ☐ Express Mail ☐ Federal Express
☐ UPS ☐ Hand

Quality Assurance/Quality Control

A. Program Overview

Groundwater Analytical conducts an active Quality Assurance program to ensure the production of high quality, valid data. This program closely follows the guidance provided by *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, US EPA QAMS-005/80 (1980), and *Test Methods for Evaluating Solid Waste*, US EPA, SW-846, Update III (1996).

Quality Control protocols include written Standard Operating Procedures (SOPs) developed for each analytical method. SOPs are derived from US EPA methodologies and other established references. Standards are prepared from commercially obtained reference materials of certified purity, and documented for traceability.

Quality Assessment protocols for most organic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. All samples, standards, blanks, laboratory control samples, matrix spikes and sample duplicates are spiked with internal standards and surrogate compounds. All instrument sequences begin with an initial calibration verification standard and a blank; and excepting GC/MS sequences, all sequences close with a continuing calibration standard. GC/MS systems are tuned to appropriate ion abundance criteria daily, or for each 12-hour operating period, whichever is more frequent.

Quality Assessment protocols for most inorganic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. Standard curves are derived from one reagent blank and four concentration levels. Curve validity is verified by standard recoveries within plus or minus ten percent of the curve.

B. Definitions

Batches are used as the basic unit for Quality Assessment. A Batch is defined as twenty or fewer samples of the same matrix which are prepared together for the same analysis, using the same lots of reagents and the same techniques or manipulations, all within the same continuum of time, up to but not exceeding 24 hours.

Laboratory Control Samples are used to assess the accuracy of the analytical method. A Laboratory Control Sample consists of reagent water or sodium sulfate spiked with a group of target analytes representative of the method analytes. Accuracy is defined as the degree of agreement of the measured value with the true or expected value. Percent Recoveries for the Laboratory Control Samples are calculated to assess accuracy.

Method Blanks are used to assess the level of contamination present in the analytical system. Method Blanks consist of reagent water or an aliquot of sodium sulfate. Method Blanks are taken through all the appropriate steps of an analytical method. Sample data reported is not corrected for blank contamination.

Surrogate Compounds are used to assess the effectiveness of an analytical method in dealing with each sample matrix. Surrogate Compounds are organic compounds which are similar to the target analytes of interest in chemical behavior, but which are not normally found in environmental samples. Percent Recoveries are calculated for each Surrogate Compound.

Quality Control Report Laboratory Control Samples

Category: **EPA Method 8260B TCL**
QC Batch ID: **VM10-1231-W**
Matrix: **Aqueous**
Units: **ug/L**

LCS
Instrument ID: **MS-10 HP 6890**
Analyzed: **02-03-11 06:45**
Analyst: **LMG**

LCSD
Instrument ID: **MS-10 HP 6890**
Analyzed: **02-03-11 07:07**
Analyst: **LMG**

CAS Number	Analyte	LCS			LCS Duplicate				QC Limits	
		Spiked	Measured	Recovery	Spiked	Measured	Recovery	RPD	Spike	RPD
74-87-3	Chloromethane	10	8.6	86 %	10	8.0	80 %	7 %	70 - 130 %	20%
75-01-4	Vinyl Chloride	10	9.6	96 %	10	8.9	89 %	7 %	70 - 130 %	20%
74-83-9	Bromomethane	10	10	105 %	10	10	100 %	4 %	70 - 130 %	20%
75-00-3	Chloroethane	10	9.5	95 %	10	9.1	91 %	5 %	70 - 130 %	20%
75-35-4	1,1-Dichloroethene	10	10	101 %	10	9.7	97 %	4 %	70 - 130 %	20%
67-64-1	Acetone	20	17	86 %	20	16	81 %	7 %	70 - 130 %	20%
75-15-0	Carbon Disulfide	20	23	116 %	20	22	109 %	6 %	70 - 130 %	20%
75-09-2	Methylene Chloride	10	10	104 %	10	9.7	97 %	6 %	70 - 130 %	20%
156-60-5	trans- 1,2-Dichloroethene	10	10	105 %	10	10	100 %	5 %	70 - 130 %	20%
1634-04-4	Methyl tert- butyl Ether (MTBE)	10	9.8	98 %	10	9.6	96 %	2 %	70 - 130 %	20%
75-34-3	1,1-Dichloroethane	10	9.6	96 %	10	9.2	92 %	4 %	70 - 130 %	20%
156-59-2	cis- 1,2-Dichloroethene	10	11	108 %	10	10	103 %	4 %	70 - 130 %	20%
78-93-3	2-Butanone (MEK)	20	18	91 %	20	18	88 %	3 %	70 - 130 %	20%
67-66-3	Chloroform	10	9.8	98 %	10	9.8	98 %	0 %	70 - 130 %	20%
71-55-6	1,1,1-Trichloroethane	10	11	111 %	10	11	107 %	4 %	70 - 130 %	20%
56-23-5	Carbon Tetrachloride	10	12	116 %	10	11	109 %	6 %	70 - 130 %	20%
71-43-2	Benzene	10	10	100 %	10	9.6	96 %	4 %	70 - 130 %	20%
107-06-2	1,2-Dichloroethane	10	9.5	95 %	10	9.1	91 %	4 %	70 - 130 %	20%
79-01-6	Trichloroethene	10	10	100 %	10	9.5	95 %	5 %	70 - 130 %	20%
78-87-5	1,2-Dichloropropane	10	9.7	97 %	10	9.3	93 %	4 %	70 - 130 %	20%
75-27-4	Bromodichloromethane	10	10	100 %	10	9.6	96 %	4 %	70 - 130 %	20%
10061-01-5	cis- 1,3-Dichloropropene	10	9.3	93 %	10	8.8	88 %	5 %	70 - 130 %	20%
108-10-1	4-Methyl-2-Pentanone (MIBK)	20	20	98 %	20	19	95 %	3 %	70 - 130 %	20%
108-88-3	Toluene	10	10	104 %	10	9.9	99 %	5 %	70 - 130 %	20%
10061-02-6	trans- 1,3-Dichloropropene	10	9.1	91 %	10	8.9	89 %	2 %	70 - 130 %	20%
79-00-5	1,1,2-Trichloroethane	10	9.9	99 %	10	10	100 %	1 %	70 - 130 %	20%
127-18-4	Tetrachloroethene	10	12	124 %	10	12	121 %	2 %	70 - 130 %	20%
591-78-6	2-Hexanone	20	20	102 %	20	19	96 %	7 %	70 - 130 %	20%
124-48-1	Dibromochloromethane	10	12	117 %	10	11	111 %	5 %	70 - 130 %	20%
108-90-7	Chlorobenzene	10	10	104 %	10	10	102 %	2 %	70 - 130 %	20%
100-41-4	Ethylbenzene	10	10	105 %	10	10	104 %	1 %	70 - 130 %	20%
108-38-3/106-42-3	meta- Xylene and para- Xylene	20	22	110 %	20	22	108 %	2 %	70 - 130 %	20%
95-47-6	ortho- Xylene	10	11	108 %	10	11	107 %	2 %	70 - 130 %	20%
100-42-5	Styrene	10	11	106 %	10	10	103 %	3 %	70 - 130 %	20%
75-25-2	Bromoform	10	11	107 %	10	10	104 %	3 %	70 - 130 %	20%
79-34-5	1,1,2,2-Tetrachloroethane	10	10	100 %	10	10	101 %	1 %	70 - 130 %	20%

QC Surrogate Compound	Spiked	Measured	Recovery	Spiked	Measured	Recovery	QC Limits
Dibromofluoromethane	10	11	113 %	10	11	112 %	70 - 130 %
1,2-Dichloroethane-d ₄	10	11	109 %	10	10	103 %	70 - 130 %
Toluene-d ₈	10	11	112 %	10	11	109 %	70 - 130 %
4-Bromofluorobenzene	10	10	103 %	10	10	103 %	70 - 130 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Sample preparation performed by EPA Method 5030B.

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

Quality Control Report Method Blank

Category: EPA Method 8260B TCL
QC Batch ID: VM10-1231-W
Matrix: Aqueous

Instrument ID: MS-10 HP 6890
Analyzed: 02-03-11 07:30
Analyst: LMG

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
74-87-3	Chloromethane	BRL		ug/L	0.5
75-01-4	Vinyl Chloride	BRL		ug/L	0.5
74-83-9	Bromomethane	BRL		ug/L	0.5
75-00-3	Chloroethane	BRL		ug/L	0.5
75-35-4	1,1-Dichloroethene	BRL		ug/L	0.5
67-64-1	Acetone	BRL		ug/L	10
75-15-0	Carbon Disulfide	BRL		ug/L	5
75-09-2	Methylene Chloride	BRL		ug/L	3
156-60-5	trans-1,2-Dichloroethene	BRL		ug/L	0.5
1634-04-4	Methyl tert-butyl Ether (MTBE)	BRL		ug/L	0.5
75-34-3	1,1-Dichloroethane	BRL		ug/L	0.5
156-59-2	cis-1,2-Dichloroethene	BRL		ug/L	0.5
78-93-3	2-Butanone (MEK)	BRL		ug/L	5
67-66-3	Chloroform	BRL		ug/L	0.5
71-55-6	1,1,1-Trichloroethane	BRL		ug/L	0.5
56-23-5	Carbon Tetrachloride	BRL		ug/L	0.5
71-43-2	Benzene	BRL		ug/L	0.5
107-06-2	1,2-Dichloroethane	BRL		ug/L	0.5
79-01-6	Trichloroethene	BRL		ug/L	0.5
78-87-5	1,2-Dichloropropane	BRL		ug/L	0.5
75-27-4	Bromodichloromethane	BRL		ug/L	0.5
10061-01-5	cis-1,3-Dichloropropene	BRL		ug/L	0.4
108-10-1	4-Methyl-2-Pentanone (MIBK)	BRL		ug/L	5
108-88-3	Toluene	BRL		ug/L	0.5
10061-02-6	trans-1,3-Dichloropropene	BRL		ug/L	0.4
79-00-5	1,1,2-Trichloroethane	BRL		ug/L	0.5
127-18-4	Tetrachloroethene	BRL		ug/L	0.5
591-78-6	2-Hexanone	BRL		ug/L	5
124-48-1	Dibromochloromethane	BRL		ug/L	0.5
108-90-7	Chlorobenzene	BRL		ug/L	0.5
100-41-4	Ethylbenzene	BRL		ug/L	0.5
108-38-3/106-42-3	meta-Xylene and para-Xylene	BRL		ug/L	0.5
95-47-6	ortho-Xylene	BRL		ug/L	0.5
100-42-5	Styrene	BRL		ug/L	0.5
75-25-2	Bromoform	BRL		ug/L	0.5
79-34-5	1,1,2,2-Tetrachloroethane	BRL		ug/L	0.5

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
Dibromofluoromethane	10	11	115 %	70 - 130 %
1,2-Dichloroethane-d ₄	10	11	114 %	70 - 130 %
Toluene-d ₈	10	11	115 %	70 - 130 %
4-Bromofluorobenzene	10	10	100 %	70 - 130 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Sample preparation performed by EPA Method 5030B.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

Certifications and Approvals

Groundwater Analytical maintains environmental laboratory certification in a variety of states.

Copies of our current certificates may be obtained from our website:

<http://www.groundwateranalytical.com/qualifications.htm>

CONNECTICUT

Department of Health Services, PH-0586

Potable Water, Wastewater, Solid Waste and Soil

http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/Out_State.pdf

MASSACHUSETTS

Department of Environmental Protection, M-MA-103

Potable Water and Non-Potable Water

<http://public.dep.state.ma.us/labcert/labcert.aspx>

Department of Labor,

Asbestos Analytical Services, Class A

Division of Occupational Safety, AA000195

http://www.mass.gov/dos/forms/la-rpt_list_aa.pdf

NEW HAMPSHIRE

Department of Environmental Services, 202708

Potable Water, Non-Potable Water, Solid and Chemical Materials

<http://www4.egov.nh.gov/DES/NHELAP>

NEW YORK

Department of Health, 11754

Potable Water, Non-Potable Water, Solid and Hazardous Waste

<http://www.wadsworth.org/labcert/elap/comm.html>

RHODE ISLAND

Department of Health,

Potable and Non-Potable Water Microbiology, Organic and Inorganic Chemistry

Division of Laboratories, LAO00054

<http://www.health.ri.gov/labs/outofstatelabs.pdf>

U.S. DEPARTMENT OF AGRICULTURE

USDA, Soil Permit, S-53921

Foreign soil import permit

VERMONT

Department of Health, VT-87643

Potable Water

http://healthvermont.gov/enviro/ph_lab/water_test.aspx#cert

Certifications and Approvals

MASSACHUSETTS
Department of Environmental Protection, M-MA-103

Groundwater Analytical maintains MassDEP environmental laboratory certification for only the methods and analytes listed below. Analyses for certified analytes are conducted in accordance with MassDEP certification standards, except as may be specifically noted in the project narrative.

Potable Water (Drinking Water)

Analyte	Method
1,2-Dibromo-3-Chloropropane	EPA 504.1
1,2-Dibromoethane	EPA 504.1
Alkalinity, Total	SM 2320-B
Antimony	EPA 200.8
Arsenic	EPA 200.8
Barium	EPA 200.7
Barium	EPA 200.8
Beryllium	EPA 200.7
Beryllium	EPA 200.8
Cadmium	EPA 200.7
Cadmium	EPA 200.8
Calcium	EPA 200.7
Chlorine, Residual Free	SM 4500-CL-G
Chromium	EPA 200.7
Copper	EPA 200.7
Copper	EPA 200.8
Cyanide, Total	Lachat 10-204-00-1-A
E. Coli (Treatment and Distribution)	Enz. Sub. SM 9223
E. Coli (Treatment and Distribution)	NA-MUG SM 9222-G
Fecal Coliform (Source Water)	MF SM 9222-D
Fluoride	EPA 300.0
Fluoride	SM 4500-F-C
Haloacetic Acids	EPA 552.2
Heterotrophic Plate Count	SM 9215-B
Lead	EPA 200.8
Mercury	EPA 245.1
Nickel	EPA 200.7
Nickel	EPA 200.8
Nitrate-N	EPA 300.0
Nitrate-N	Lachat 10-107-04-1-C
Nitrite-N	EPA 300.0
Nitrite-N	Lachat 10-107-04-1-C
pH	SM 4500-H-B
Selenium	EPA 200.8
Silver	EPA 200.7
Silver	EPA 200.8
Sodium	EPA 200.7
Sulfate	EPA 300.0
Thallium	EPA 200.8
Total Coliform (Treatment and Distribution)	Enz. Sub. SM 9223
Total Coliform (Treatment and Distribution)	MF SM 9222-B
Total Dissolved Solids	SM 2540-C
Trihalomethanes	EPA 524.2
Turbidity	SM 2130-B
Volatile Organic Compounds	EPA 524.2

Non-Potable Water (Wastewater)

Analyte	Method
Aluminum	EPA 200.8
Ammonia-N	Lachat 10-107-06-1-B
Antimony	EPA 200.7
Antimony	EPA 200.8
Arsenic	EPA 200.7
Arsenic	EPA 200.8
Beryllium	EPA 200.7
Beryllium	EPA 200.8
Beta-BHC	EPA 608
Biochemical Oxygen Demand	SM 5210-B
Cadmium	EPA 200.7
Cadmium	EPA 200.8
Calcium	EPA 200.7
Chemical Oxygen Demand	SM 5220-D
Chlordane	EPA 608
Chloride	EPA 300.0
Chlorine, Total Residual	SM 4500-CL-G
Chromium	EPA 200.7
Chromium	EPA 200.8
Cobalt	EPA 200.7
Cobalt	EPA 200.8
Copper	EPA 200.7
Copper	EPA 200.8
Cyanide, Total	Lachat 10-204-00-1-A
DDD	EPA 608
DDE	EPA 608
DDT	EPA 608
Delta-BHC	EPA 608
Dieldrin	EPA 608
Endosulfan I	EPA 608
Endosulfan II	EPA 608
Endosulfan Sulfate	EPA 608
Endrin	EPA 608
Endrin Aldehyde	EPA 608
Gamma-BHC	EPA 608
Hardness (CaCO ₃), Total	EPA 200.7
Hardness (CaCO ₃), Total	SM 2340-B
Heptachlor	EPA 608
Heptachlor Epoxide	EPA 608
Iron	EPA 200.7
Kjeldahl-N	Lachat 10-107-06-02-D
Lead	EPA 200.7
Magnesium	EPA 200.7
Manganese	EPA 200.7
Manganese	EPA 200.8
Mercury	EPA 245.1
Molybdenum	EPA 200.7
Molybdenum	EPA 200.8
Nickel	EPA 200.7
Nickel	EPA 200.8
Nitrate-N	EPA 300.0
Nitrate-N	Lachat 10-107-04-1-C
Non-Filterable Residue	SM 2540-D
Oil and Grease	EPA 1664

Non-Potable Water (Wastewater)

Analyte	Method
Aldrin	EPA 608
Alkalinity, Total	SM 2320-B
Alpha-BHC	EPA 608
Aluminum	EPA 200.7

Certifications and Approvals

MASSACHUSETTS**Department of Environmental Protection, M-MA-103**

Groundwater Analytical maintains MassDEP environmental laboratory certification for only the methods and analytes listed below. Analyses for certified analytes are conducted in accordance with MassDEP certification standards, except as may be specifically noted in the project narrative.

Non-Potable Water (Wastewater)

Analyte	Method
Orthophosphate	Lachat 10-115-01-1-A
pH	SM 4500-H-B
Phenolics, Total	EPA 420.4
Phenolics, Total	Lachat 10-210-00-1-B
Phosphorus, Total	Lachat 10-115-01-1-C
Phosphorus, Total	SM 4500-P-B,E
Polychlorinated Biphenyls (Oil)	EPA 600/4-81-045
Polychlorinated Biphenyls (Water)	EPA 608
Potassium	EPA 200.7
Selenium	EPA 200.7
Selenium	EPA 200.8
Silver	EPA 200.7
Sodium	EPA 200.7
Specific Conductivity	SM 2510-B
Strontium	EPA 200.7
Sulfate	EPA 300.0
SVOC-Acid Extractables	EPA 625
SVOC-Base/Neutral Extractables	EPA 625
Thallium	EPA 200.7
Thallium	EPA 200.8
Titanium	EPA 200.7
Total Dissolved Solids	SM 2540-C
Total Organic Carbon	SM 5310-B
Toxaphene	EPA 608
Vanadium	EPA 200.7
Vanadium	EPA 200.8
Volatile Aromatics	EPA 602
Volatile Aromatics	EPA 624
Volatile Halocarbons	EPA 624
Zinc	EPA 200.7
Zinc	EPA 200.8

GROUNDWATER ANALYTICAL

SB

Groundwater Analytical, Inc.
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228 Main Street
Buzzards Bay, MA 02532

Telephone (508) 759-4441
FAX (508) 759-4475
www.groundwateranalytical.com

February 24, 2011

Mr. David Bennett
Bennett Environmental Associates, Inc.
P.O. Box 1743
Brewster, MA 02631

LABORATORY REPORT

Project: **Town of Harwich/BEA10-10288**
Lab ID: **139850**
Received: **02-18-11**

Dear Dave:

Enclosed are the analytical results for the above referenced project. The project was processed for Rush 3 Business Day turnaround.

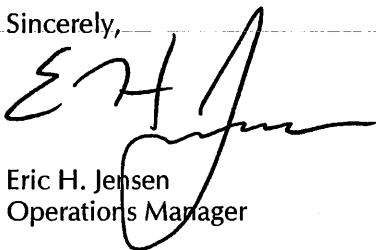
This letter authorizes the release of the analytical results, and should be considered a part of this report. This report contains a sample receipt report detailing the samples received, a project narrative indicating project changes and non-conformances, a quality control report, and a statement of our state certifications.

The analytical results contained in this report meet all applicable NELAC standards, except as may be specifically noted, or described in the project narrative. The analytical results relate only to the samples received. This report may only be used or reproduced in its entirety.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Should you have any questions concerning this report, please do not hesitate to contact me.

Sincerely,



Eric H. Jensen
Operations Manager

EHJ/elm
Enclosures

Sample Receipt Report

Project: **Town of Harwich/BEA10-10288**
Client: **Bennett Environmental Associates, Inc.**
Lab ID: **139850**

Delivery: **GWA Courier**
Airbill: **n/a**
Lab Receipt: **02-18-11**

Temperature: **2.0°C**
Chain of Custody: **Present**
Custody Seal(s): **n/a**

Lab ID	Field ID		Matrix	Sampled	Method				Notes
139850-1	BEA-1S		Aqueous	2/18/11 10:00	TPH by GC ASTM D3328-00 Mod				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C1332292	1 L Amber Glass	Proline	BX38107	H2SO4	R-4252H	12-15-10	n/a		
C1332288	1 L Amber Glass	Proline	BX38107	H2SO4	R-4252H	12-15-10	n/a		

**ASTM Method D3328-00 (Modified)
Hydrocarbon Fingerprint by GC/FID**

Field ID: **BEA-1S**
Project: **Town of Harwich/BEA10-10288**
Client: **Bennett Environmental Associates, Inc.**

Laboratory ID: **139850-1**
Sampled: **02-18-11 10:00**
Received: **02-18-11 16:30**
Extracted: **02-22-11 20:00**
Analyzed: **02-23-11 11:18**
Analyst: **MB**

Matrix: **Aqueous**
Container: **1 L Amber Glass**
Preservation: **H2SO4/ Cool**

QC Batch ID: **HF-2312-F**
Instrument ID: **GC4 HP 5890**
Sample Volume: **1,000 mL**
Final Volume: **1 mL**
Dilution Factor: **1**

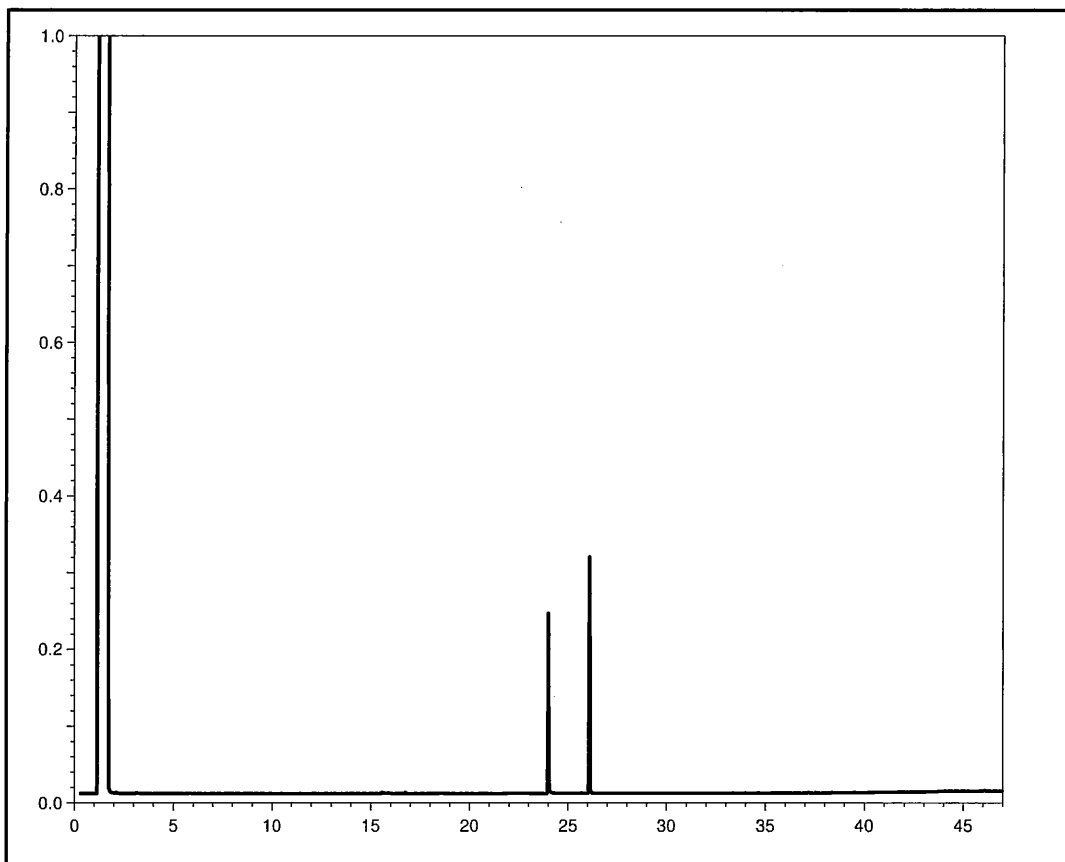
Qualitative Identification				
No petroleum product was identified for this sample.				
Analyte	Concentration		Notes	Units
Total Petroleum Hydrocarbons	BRL			mg/L
QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
<i>ortho</i> -Terphenyl	0.040	0.031	76 %	60 - 140 %

Method Reference: Comparison of Waterborne Petroleum Oils by Gas Chromatography, Annual Book of ASTM Standards, Volume 11.02, American Society for Testing and Materials (2000).
Method modified to quantify total petroleum hydrocarbons in the range n-C 9 through n-C 36. Results are quantified on the basis of a series of aromatic and aliphatic hydrocarbons, using 5-alpha-androstane as an internal standard.
Sample extraction performed by separatory funnel technique.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

Lab ID: 139850-01

Hydrocarbons Laboratory



Retention Time (Minutes)

Project Narrative

Project: **Town of Harwich/BEA10-10288**
Client: **Bennett Environmental Associates, Inc.**

Lab ID: **139850**
Received: **02-18-11 16:30**

A. Documentation and Client Communication

The following documentation discrepancies, and client changes or amendments were noted for this project:

- 1 . No documentation discrepancies, changes, or amendments were noted.

B. Method Modifications, Non-Conformances and Observations

The sample(s) in this project were analyzed by the references analytical method(s), and no method modifications, non-conformances or analytical issues were noted, except as indicated below:

- 1 . No method modifications, non-conformances or analytical issues were noted.

Page 6 of 12

Quality Assurance/Quality Control

A. Program Overview

Groundwater Analytical conducts an active Quality Assurance program to ensure the production of high quality, valid data. This program closely follows the guidance provided by *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, US EPA QAMS-005/80 (1980), and *Test Methods for Evaluating Solid Waste*, US EPA, SW-846, Update III (1996).

Quality Control protocols include written Standard Operating Procedures (SOPs) developed for each analytical method. SOPs are derived from US EPA methodologies and other established references. Standards are prepared from commercially obtained reference materials of certified purity, and documented for traceability.

Quality Assessment protocols for most organic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. All samples, standards, blanks, laboratory control samples, matrix spikes and sample duplicates are spiked with internal standards and surrogate compounds. All instrument sequences begin with an initial calibration verification standard and a blank; and excepting GC/MS sequences, all sequences close with a continuing calibration standard. GC/MS systems are tuned to appropriate ion abundance criteria daily, or for each 12 hour operating period, whichever is more frequent.

Quality Assessment protocols for most inorganic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. Standard curves are derived from one reagent blank and four concentration levels. Curve validity is verified by standard recoveries within plus or minus ten percent of the curve.

B. Definitions

Batches are used as the basic unit for Quality Assessment. A Batch is defined as twenty or fewer samples of the same matrix which are prepared together for the same analysis, using the same lots of reagents and the same techniques or manipulations, all within the same continuum of time, up to but not exceeding 24 hours.

Laboratory Control Samples are used to assess the accuracy of the analytical method. A Laboratory Control Sample consists of reagent water or sodium sulfate spiked with a group of target analytes representative of the method analytes. Accuracy is defined as the degree of agreement of the measured value with the true or expected value. Percent Recoveries for the Laboratory Control Samples are calculated to assess accuracy.

Method Blanks are used to assess the level of contamination present in the analytical system. Method Blanks consist of reagent water or an aliquot of sodium sulfate. Method Blanks are taken through all the appropriate steps of an analytical method. Sample data reported is not corrected for blank contamination.

Surrogate Compounds are used to assess the effectiveness of an analytical method in dealing with each sample matrix. Surrogate Compounds are organic compounds which are similar to the target analytes of interest in chemical behavior, but which are not normally found in environmental samples. Percent Recoveries are calculated for each Surrogate Compound.

**Quality Control Report
Laboratory Control Sample**

Category: **ASTM D3328-00 Mod Hydrocarbon Fingerprint**
QC Batch ID: **HF-2312-F**
Matrix: **Aqueous**
Units: **mg/L**

Instrument ID: **GC4 HP 5890**
Extracted: **02-22-11 20:00**
Analyzed: **02-23-11 12:06**
Analyst: **MB**

Analyte	Spiked	Measured	Recovery	QC Limits
Fuel Oil No. 2	2.0	1.5	75 %	60 - 140 %

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
<i>ortho</i> -Terphenyl	0.040	0.031	78 %	60 - 140 %

Method Reference: Comparison of Waterborne Petroleum Oils by Gas Chromatography, Annual Book of ASTM Standards, Volume 11.02, American Society for Testing and Materials (2000).
Method modified to quantify total petroleum hydrocarbons in the range n-C 9 through n-C 36. Results are quantified on the basis of a series of aromatic and aliphatic hydrocarbons, using 5-alpha-androstane as an internal standard.
Sample extraction performed by separatory funnel technique.

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

**Quality Control Report
Method Blank**

Category: ASTM D3328-00 Mod Hydrocarbon Fingerprint
QC Batch ID: HF-2312-F
Matrix: Aqueous

Instrument ID: GC4 HP 5890
Extracted: 02-22-11 20:00
Analyzed: 02-23-11 10:21
Analyst: MB

Analyte	Concentration	Notes	Units	Reporting Limit
Total Petroleum Hydrocarbons	BRL		mg/L	0.2

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
ortho-Terphenyl	0.040	0.032	80 %	60 - 140 %

Method Reference: Comparison of Waterborne Petroleum Oils by Gas Chromatography, Annual Book of ASTM Standards, Volume 11.02, American Society for Testing and Materials (2000).
Method modified to quantify total petroleum hydrocarbons in the range n-C 9 through n-C 36. Results are quantified on the basis of a series of aromatic and aliphatic hydrocarbons, using 5-alpha-androstane as an internal standard.
Sample extraction performed by separatory funnel technique.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

Certifications and Approvals

Groundwater Analytical maintains environmental laboratory certification in a variety of states.
Copies of our current certificates may be obtained from our website:

<http://www.groundwateranalytical.com/qualifications.htm>

CONNECTICUT

Department of Health Services, PH-0586

Potable Water, Wastewater, Solid Waste and Soil

http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/Out_State.pdf

MASSACHUSETTS

Department of Environmental Protection, M-MA-103

Potable Water and Non-Potable Water

<http://public.dep.state.ma.us/labcert/labcert.aspx>

Department of Labor,

Asbestos Analytical Services, Class A

Division of Occupational Safety, AA000195

http://www.mass.gov/dos/forms/la-rpt_list_aa.pdf

NEW HAMPSHIRE

Department of Environmental Services, 202708

Potable Water, Non-Potable Water, Solid and Chemical Materials

<http://www4.egov.nh.gov/DES/NHELAP>

NEW YORK

Department of Health, 11754

Potable Water, Non-Potable Water, Solid and Hazardous Waste

<http://www.wadsworth.org/labcert/elap/comm.html>

RHODE ISLAND

Department of Health,

Potable and Non-Potable Water Microbiology, Organic and Inorganic Chemistry

Division of Laboratories, LAO00054

<http://www.health.ri.gov/labs/outofstatelabs.pdf>

U.S. DEPARTMENT OF AGRICULTURE

USDA, Soil Permit, S-53921

Foreign soil import permit

VERMONT

Department of Health, VT-87643

Potable Water

http://healthvermont.gov/enviro/ph_lab/water_test.aspx#cert

Certifications and Approvals

MASSACHUSETTS

Department of Environmental Protection, M-MA-103

Groundwater Analytical maintains MassDEP environmental laboratory certification for only the methods and analytes listed below. Analyses for certified analytes are conducted in accordance with MassDEP certification standards, except as may be specifically noted in the project narrative.

Potable Water (Drinking Water)		Non-Potable Water (Wastewater)	
Analyte	Method	Analyte	Method
1,2-Dibromo-3-Chloropropane	EPA 504.1	Aluminum	EPA 200.8
1,2-Dibromoethane	EPA 504.1	Ammonia-N	Lachat 10-107-06-1-B
Alkalinity, Total	SM 2320-B	Antimony	EPA 200.7
Antimony	EPA 200.8	Antimony	EPA 200.8
Arsenic	EPA 200.8	Arsenic	EPA 200.7
Barium	EPA 200.7	Arsenic	EPA 200.8
Barium	EPA 200.8	Beryllium	EPA 200.7
Beryllium	EPA 200.7	Beryllium	EPA 200.8
Beryllium	EPA 200.8	Beta-BHC	EPA 608
Cadmium	EPA 200.7	Biochemical Oxygen Demand	SM 5210-B
Cadmium	EPA 200.8	Cadmium	EPA 200.7
Calcium	EPA 200.7	Cadmium	EPA 200.8
Chlorine, Residual Free	SM 4500-CL-G	Calcium	EPA 200.7
Chromium	EPA 200.7	Chemical Oxygen Demand	SM 5220-D
Copper	EPA 200.7	Chlordane	EPA 608
Copper	EPA 200.8	Chloride	EPA 300.0
Cyanide, Total	Lachat 10-204-00-1-A	Chlorine, Total Residual	SM 4500-CL-G
E. Coli (Treatment and Distribution)	Enz. Sub. SM 9223	Chromium	EPA 200.7
E. Coli (Treatment and Distribution)	NA-MUG SM 9222-G	Chromium	EPA 200.8
Fecal Coliform (Source Water)	MF SM 9222-D	Cobalt	EPA 200.7
Fluoride	EPA 300.0	Cobalt	EPA 200.8
Fluoride	SM 4500-F-C	Copper	EPA 200.7
Haloacetic Acids	EPA 552.2	Copper	EPA 200.8
Heterotrophic Plate Count	SM 9215-B	Cyanide, Total	Lachat 10-204-00-1-A
Lead	EPA 200.8	DDD	EPA 608
Mercury	EPA 245.1	DDE	EPA 608
Nickel	EPA 200.7	DDT	EPA 608
Nickel	EPA 200.8	Delta-BHC	EPA 608
Nitrate-N	EPA 300.0	Dieldrin	EPA 608
Nitrate-N	Lachat 10-107-04-1-C	Endosulfan I	EPA 608
Nitrite-N	EPA 300.0	Endosulfan II	EPA 608
Nitrite-N	Lachat 10-107-04-1-C	Endosulfan Sulfate	EPA 608
pH	SM 4500-H-B	Endrin	EPA 608
Selenium	EPA 200.8	Endrin Aldehyde	EPA 608
Silver	EPA 200.7	Gamma-BHC	EPA 608
Silver	EPA 200.8	Hardness (CaCO ₃), Total	EPA 200.7
Sodium	EPA 200.7	Hardness (CaCO ₃), Total	SM 2340-B
Sulfate	EPA 300.0	Heptachlor	EPA 608
Thallium	EPA 200.8	Heptachlor Epoxide	EPA 608
Total Coliform (Treatment and Distribution)	Enz. Sub. SM 9223	Iron	EPA 200.7
Total Coliform (Treatment and Distribution)	MF SM 9222-B	Kjeldahl-N	Lachat 10-107-06-02-D
Total Dissolved Solids	SM 2540-C	Lead	EPA 200.7
Trihalomethanes	EPA 524.2	Magnesium	EPA 200.7
Turbidity	SM 2130-B	Manganese	EPA 200.7
Volatile Organic Compounds	EPA 524.2	Manganese	EPA 200.8
Non-Potable Water (Wastewater)		Mercury	EPA 245.1
Analyte	Method	Molybdenum	EPA 200.7
Aldrin	EPA 608	Molybdenum	EPA 200.8
Alkalinity, Total	SM 2320-B	Nickel	EPA 200.7
Alpha-BHC	EPA 608	Nickel	EPA 200.8
Aluminum	EPA 200.7	Nitrate-N	EPA 300.0
		Nitrate-N	Lachat 10-107-04-1-C
		Non-Filterable Residue	SM 2540-D
		Oil and Grease	EPA 1664

Certifications and Approvals

MASSACHUSETTS**Department of Environmental Protection, M-MA-103**

Groundwater Analytical maintains MassDEP environmental laboratory certification for only the methods and analytes listed below. Analyses for certified analytes are conducted in accordance with MassDEP certification standards, except as may be specifically noted in the project narrative.

Non-Potable Water (Wastewater)

Analyte	Method
Orthophosphate	Lachat 10-115-01-1-A
pH	SM 4500-HI-B
Phenolics, Total	EPA 420.4
Phenolics, Total	Lachat 10-210-00-1-B
Phosphorus, Total	Lachat 10-115-01-1-C
Phosphorus, Total	SM 4500-P-B,E
Polychlorinated Biphenyls (Oil)	EPA 600/4-81-045
Polychlorinated Biphenyls (Water)	EPA 608
Potassium	EPA 200.7
Selenium	EPA 200.7
Selenium	EPA 200.8
Silver	EPA 200.7
Sodium	EPA 200.7
Specific Conductivity	SM 2510-B
Strontium	EPA 200.7
Sulfate	EPA 300.0
SVOC-Acid Extractables	EPA 625
SVOC-Base/Neutral Extractables	EPA 625
Thallium	EPA 200.7
Thallium	EPA 200.8
Titanium	EPA 200.7
Total Dissolved Solids	SM 2540-C
Total Organic Carbon	SM 5310-B
Toxaphene	EPA 608
Vanadium	EPA 200.7
Vanadium	EPA 200.8
Volatile Aromatics	EPA 602
Volatile Aromatics	EPA 624
Volatile Halocarbons	EPA 624
Zinc	EPA 200.7
Zinc	EPA 200.8

APPENDIX E

BENNETT ENVIRONMENTAL ASSOCIATES, INC.

LICENSED SITE PROFESSIONALS ♡ ENVIRONMENTAL SCIENTISTS ♡ GEOLOGISTS ♡ SANITARIANS

1573 Main Street - P.O. Box 1743, Brewster, MA 02631 ♡ 508-896-1706 ♡ Fax 508-896-5109 ♡ www.bennett-ea.com

QUALITY ASSURANCE & QUALITY CONTROL PROGRAM

Quality Assurance & Quality Control Program
For Soil and Groundwater Sampling

INTRODUCTION

The Quality Assurance & Quality Control (QA/QC) Program outlines the purpose, policies, organization and operations to support sampling work conducted by BENNETT ENVIRONMENTAL ASSOCIATES, INC. The procedures and protocols represented herein are consistent with the MA DEP "Standard References for Monitor Wells" [WSC-310-91], and the recommendations of a MA certified laboratory. Implementation of this program will help to ensure the validity of data used to provide professional engineering and environmental opinions to clients.

The following definitions are used in the QA/QC Program:

Quality Assurance refers to the concepts used in defining a system for verifying and maintaining a desired level of quality in a product or process.

Quality Control is a specific, step-by-step description of how the Quality Assurance Program will be carried out.

This QA/QC Program guides field sampling activities. Project specific QA/QC Programs are adopted when warranted. Modifications to the QA/QC Program may be made only after specific approval by the QA/QC Officer (Project Manager).

The specific objectives of the QA/QC Program are to:

1. Specify the level of quality of each field procedure used in collecting samples;
2. Identify deficiencies in field procedures which might affect the quality of data; and
2. Require sufficient documentation to verify the credibility of the sampling methods employed.

PROGRAM ORGANIZATION AND RESPONSIBILITY

The Project Manager of BENNETT ENVIRONMENTAL ASSOCIATES, INC. is responsible for the quality of work produced. The Project Manager directs the QA/QC Program to document the control of field efforts and resulting data.

In this capacity, the Project Manager is expected to do the following:

1. Prepare detailed QC plans;
2. Obtain analytical and sampling procedures reference materials;
3. Ensure that all field test and measurement equipment is maintained and calibrated properly;
4. Monitor quality assurance activities to ensure conformance with authorized policies and procedures, sound practices and to recommend improvements as necessary;
5. Ensure that all field sampling is conducted in accordance with guidelines contained herein;
6. Oversee all field sampling efforts to detect conditions which might directly or indirectly jeopardize the utility of resulting analytical data, such as improper calibration of equipment or cross-contamination through improper storage of samples;
7. Ensure that sample handling procedures are adequate for the sample types received; and
8. Inspect the quality of purchased sampling materials.

SAMPLE MANAGEMENT, COLLECTION, AND PREPARATION

Introduction

Sample management and stringent documentation are essential for successful quality assurance. The procedures in this section are designed to ensure collection of samples which truly represent the matrix being sampled by eliminating trace levels of contaminants from external sources.

Sample Management

The management of samples, up to the point of delivery to the laboratory either by courier or in person, is under the supervision of the Project Manager, who will ensure that samples are collected, labeled, preserved, stored, and transported according to the prescribed methods. If significant deviations from the sampling protocol occur, resulting in a suspected compromise of the sample integrity, all samples collected during the sampling effort prior to correction of the procedure will be discarded and fresh samples collected.

Sample Collection

Groundwater

Groundwater samples will not be collected immediately following well development. Sufficient time will be allowed for groundwater to stabilize and approach chemical equilibrium with the well construction materials. Monitoring wells will be sampled in accordance with the following sampling procedures:

1. Identify the well and record the well number on the Monitoring Well Sampling Log (attached).
2. Open the well cap and measure total organic volatile (TOV) concentrations at the wellhead with the use of a portable photoionization detector. Record levels detected.
3. Measure groundwater level to the nearest 0.01 feet from the top of the well casing using a water level indicator. The water level measurement will be taken from a permanent reference point on the well casing. The indicator will be lowered into the well casing with care to provide for the least degree of disturbance to the water surface. The measurement of well depth will only be collected after sampling is completed to avoid the resuspension of settled solids from the formation. Record water level on a Monitoring Well Sampling Log (attached). Water level indicators will be decontaminated between wells.
4. The volume of standing water in the well casing will be calculated and recorded on the Monitoring Well Sampling Log.
5. Purging and sampling should proceed in progression from least to most contaminated well, if known. A low-flow pump with a flow-through cell is preferred. The pump should be lowered to the middle of the screened interval or slightly above. The pump is started at its lowest speed setting and slowly increased until discharge occurs. The water level indicator should be used to monitor drawdown within the well and the pump speed adjusted until there is little or no drawdown ($<0.3'$). Water level and pumping rates will be monitored every three to five minutes.
6. During well purging (at least three (3) well volumes), monitor indicator parameters: temperature, pH, conductivity and dissolved oxygen. These parameters are considered to be stabilized when three consecutive readings taken three to five minutes apart are within ± 0.1 for pH, $\pm 3\%$ for conductivity, and $\pm 10\%$ for dissolved oxygen. Upon stabilization, the concentration will be recorded on the Monitoring Well Sampling Log. Other sampling methods may be used with compound specific parameters used to determine stabilization.
7. Samples will be placed into laboratory sterilized and/or preserved, pre-labeled containers, taking care to minimize agitation of the sample [Refer to attached "Recommended Sample Containers..." Groundwater Analytical]. Volatile organic compound (VOC) samples will be collected first.
8. Samples will be logged in on an appropriate chain-of-custody form.
9. All groundwater samples will be stored in a cooler or refrigerator at approximately 4EC. The following blanks may be collected as required:

Field blank: One field blank should be collected from each water source used for

sampling equipment decontamination or for assisting well development procedures.

Equipment blank: One equipment blank should be collected prior to the commencement of field work from each set of sampling equipment used that day.

Trip blank: A trip blank is required to accompany each volatile sample shipment. These blanks are prepared by filling a 40-mL VOA vial with distilled/deionized water.

When sampling water for volatile compounds, care must be exercised to prevent loss of compound through evaporation and to control susceptibility to outside contamination. Precautionary measures include:

1. Avoiding engine exhaust, gasoline containers, degreasing solvents, solvent-laden rags and noncompatible decontamination agents;
2. Sampling bottles will only be opened at the time of sampling and quickly closed after collecting the sample, preventing aeration of the sample with the atmosphere or any other gas;
3. Slowly filling bottles to capacity with sample and securing cap without entraining air bubbles;
4. Inverting the bottle while tapping lightly to check for air bubbles;
5. Adding additional sample to eliminate air bubbles, if present. Repeating Steps 3 and 4;
6. Placing samples on ice (approximately 4EC) immediately after collection in a dark, dry location;
7. Segregating samples with a secondary barrier such as zip-lock bags, etc.; and
8. Analyzing sample as soon as possible within the specific holding times after collection.

Dedicated equipment is preferred. Where impractical or cost-prohibitive, pump tubing will be decontaminated as follows:

1. Pump non-phosphate detergent solution through system for two minutes.
2. Pump clean hot tap water through system for two minutes or until clear, whichever is longer.
3. Pump analyte-free water through system for two minutes.
4. Seal tubing ends; wrap and label with date of cleaning.

Soils

The procedures to be used when collecting and screening soil samples are outlined below:

1. Prior to sampling surficial soils, surface vegetation, rocks, leaves, and debris will be cleared from the sample point to allow collection of a clean soil sample. If surficial soil samples are to be collected, a hand trowel or shovel will be used. The sampling equipment will be decontaminated as outlined below.
2. Boring samples will be collected via drilling rig-operated split spoon procedures or from a hand held bucket auger. Soil samples collected from excavations or test pits will be collected directly with a decontaminated sampling device.
3. Soil samples collected for TOV screening will be placed in glass soil jars with aluminum foil placed under the screw cap. Samples will be allowed to warm to ambient temperature before screening or will be screened in a heated vehicle after warming. The jar will be shaken for fifteen seconds prior to warming and after warming to ensure proper headspace development. Total organic vapors will be measured via a portable photoionization detector (PID) and their concentration recorded either on a Geological Borehole Log or Field Response Log.
4. Soil samples will be collected into pre-labeled, laboratory sterilized and/or preserved jars and preserved in a cooler or refrigerator at approximately 4EC.
5. Sample containers will be marked to indicate sampling date, time, location, and depth. Samples will be logged in on appropriate chain-of-custody forms.
6. The stratigraphy of each soil boring and test pit excavation, and the construction of each monitoring well will be recorded by the on-site geologist on the appropriate Geologic Borehole Log (copy attached).

When sampling soils for volatile compounds, care must be exercised to prevent loss of compound and to control susceptibility to outside contamination. Precautionary measures include:

1. Avoiding engine exhaust, gasoline containers, degreasing solvents, solvent-laden rags and non-compatible decontamination agents;
2. Opening sampling bottles only at the time of sampling and quickly closing after collecting the sample;
3. Placing samples on ice (approximately 4E C) immediately after collection in a dark, dry location;
4. Segregating samples with a secondary barrier such as zip-lock bags, etc.; and
5. Analyzing sample as soon as possible within the specific holding times after collection.

Soil sampling equipment (shovel, auger, etc.) will be decontaminated between each sampling location with a potable water rinse, alconox soap wash, and a final potable water rinse.

Drilling and excavating apparatus (augers, rods, casing, core barrels, backhoe bucket, and other

equipment coming in contact with the borehole or excavation) will be decontaminated between each boring and excavation. If necessary, an alconox soap wash followed by a steam cleaning will be included.

Sample Preservation

To prevent or retard the degradation/modification of chemicals in samples during transit and storage, the samples will be refrigerated at or below 4EC in appropriately preserved containers. Samples will be delivered to the laboratory by courier or by overnight delivery service.

DATA MANAGEMENT

Logging of Samples

The accountability of a sample begins when the sample is taken from its natural environment. Sample handling (chain-of-custody) records must be completed at the time of sampling. The following chain-of-custody procedure must be implemented by the Field Team Leader to assure sample integrity.

1. The samples are under custody of the Field Team Leader if:
 - a. they are in his (or her) possession;
 - b. they are in view after being in possession;
 - c. they are locked up or sealed securely to prevent tampering; or,
 - d. they are in a designated secure area.
2. The “original” of the sample handling form must accompany the samples at all times after collection. A copy of the sample handling form is kept by the Field Team Leader.
3. When possession of the samples is transferred, the individuals relinquishing and receiving will sign, date, and note the time on the chain-of-custody.

The chain-of-custody will contain information to distinguish each sample from any other sample. This information will include:

1. The project for which sampling is being conducted;
2. The matrix being samples (air, groundwater, soil, etc.);
3. The sampling date and time;
4. Field sample identification number and chain-of-custody identification number;
5. The number and type of containers and the type of preservative used (if any); and,
6. Signature of the person performing the sampling.

Each sample will be assigned a unique identification number or description, which will be marked on the sample container. The chain-of-custody will be forwarded to the laboratory with the samples. As a precaution against this record being lost or altered, the sampling personnel will retain a copy documenting all information up until the first change of sample custody. This record will be filed in the project folder as maintained by the Project Manager.

DISCLAIMER: The Quality Assurance and Quality Control Program outlined herein is intended as a field guidance document only and is not intended to represent techniques and requirements for all sampling procedures. While BENNETT ENVIRONMENTAL ASSOCIATES, INC. makes every effort to keep our QA/QC Program updated, this document should not be relied upon as a guarantee or warranty representing the most recent policies and techniques used. The United States Environmental Protection Agency and the Massachusetts Department of Environmental Protection should be consulted for sampling procedures relative to specific compounds.

FORM SAMPLES

BENNETT ENVIRONMENTAL ASSOCIATES, INC.

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Brewster, MA 02631

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MONITORING WELLS SAMPLING LOG RESPIRATION ANALYSIS

Date(s) _____ Job Name _____

Location _____ Job Number _____

Sampler _____

Well Number	Total Depth of Well (feet)	Approx. Depth to Water (feet)	Standing Water Height (feet)	Length of screen above SWL	HNU PI-101 (ppm)	Methane (%CH ₄)	Oxygen (% O ₂)	Carbon Dioxide (%CO ₂)	Comments:

Notes:

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INSPECTORS DAILY RECORD OF WORK PROGRESS

Date: _____ REPORT NUMBER:

Job Name: _____ Job Number: _____

Feature: _____

Contractor: _____

Type of Work: _____

Weather Conditions: _____ Temperature: _____

Contractor's Work Force (Indicate classification, including subcontractor personnel)








Bennett Environmental Associates:

Equipment in use or idled (Identify which)

Materials or equipment delivered, quantity or pay items placed

Non-conforming materials or work, field problems, inspections of previously reported deficiencies

Summary of construction activities

BENNETT ENVIRONMENTAL ASSOCIATES, INC. 1573 Main St., P.O. Box 1743 Brewster, MA. 02631				Project Name: _____ Project Location: _____ Project Number: _____				Sheet _____ Boring No. _____ Location _____ Surface Elev. _____ Start Date _____ Finish Date _____ Driller _____ Inspector _____																											
Groundwater Readings <table border="1"> <tr> <th>Date</th> <th>Reading</th> </tr> <tr><td>1</td><td></td></tr> <tr><td>2</td><td></td></tr> <tr><td>3</td><td></td></tr> </table>				Date	Reading	1		2		3		<table border="1"> <tr> <th>Type</th> <th>Casing</th> <th>Sampler</th> <th>Core</th> </tr> <tr> <td>Size I.D.</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Hammer Wt.</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Hammer Fall</td> <td></td> <td></td> <td></td> </tr> </table>				Type	Casing	Sampler	Core	Size I.D.				Hammer Wt.				Hammer Fall							
Date	Reading																																		
1																																			
2																																			
3																																			
Type	Casing	Sampler	Core																																
Size I.D.																																			
Hammer Wt.																																			
Hammer Fall																																			
Depth	Sample type-No.	Sampling Depth (ft)	Inches Pen Rec		Blow Count 6"				TOV Reading	Soil Description	Well Specs	Interpreted Geology																							
5-ft																																			
10-ft																																			
15-ft																																			
20-ft																																			
25-ft																																			
30-ft																																			
35-ft																																			
40-ft																																			
45-ft																																			
 Sand  Gravel  Silt  Top/Sub Soil  Clay  Peat  Fill	Cohesive Soils < 2 = very soft 2-4 = soft 4-8 = medium stiff 8-15 = stiff 15-30 = very stiff > 30 = hard	Granular Soils < 4 = very loose 5-10 = loose 11-30 = medium 30-50 = dense > 50 = very dense	Sample Type SS - split spoon ST - shelly tube AF - auger flights RC - rock core MA - microliners HA - hand auger	SWL: (+/-) NOTES: _____																															

LICENSED SITE PROFESSIONALS, ENVIRONMENTAL SCIENTISTS, GEOLOGISTS, SANITARIANS

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Variable - Head Test

Project:	_____			Site/Location:	_____		
Inspector:	_____	Date:	_____	Checked By:	_____	Date:	_____
Time:	_____	Ground Elevation:	_____	Reference Elevation:	_____		
Casing ID.:	_____	Casing O.D.:	_____				
Depth of Boring (A):	_____			Depth to Top of Test Section (B):	_____		
Depth of Groundwater Table (H):	_____			Length of Test Section (L):	_____		
Type of Material in Test Zone (USC or OTHER):	_____						
Comments:	_____						

A, B, H&L are defined above

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SIEVE ANALYSIS DATA AND COMPUTATION SHEET

Date: _____ Sheet _____ of _____
Job Name: _____ Job Number: _____
Sample Number: _____
Sample Collected By: _____ Sample Tested By: _____
Notes: _____

SIEVE OPENING IN MILLIMETERS	SIEVE MESH	WEIGHT RETAINED IN GRAMS (Cumulative)	PERCENT RETAINED (Cumulative)	CUMULATIVE PERCENT FINER	PROJECT MANUAL SPECIFICATION (USCS)
2.36	8				Fine gravel
2.0	10				V. Fine Gravel
1.0	18				V. Coarse Sand
.5	35				Coarse Sand
.25	60				Medium Sand
.125	100				Fine Sand
.075	200				V. Fine Sand
PAN	PAN				Silty/Clay
PASSED MESH SIEVE TOTAL					

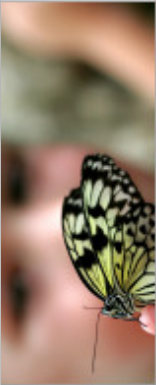
Sample Weight Wet:

Sample Weight Dry:

Percent Moisture:

Sample Weight Passed Through Sieves:

TECHNICAL REFERENCE



SAMPLE REQUIREMENTS
ANALYTE LISTS
USEFUL LINKS

SAMPLE REQUIREMENTS

Click on any section below!

- Volatle Organics by Gas Chromatography/Mass Spectrometry (GC/MS)
- Volatle Organics by Gas Chromatography (GC)
- Semivolatle Organics by Gas Chromatography/Mass Spectrometry (GC/MS)
- Pesticides, PCBs and Herbicides by Gas Chromatography (GC)
- Petroleum Hydrocarbons by Gas Chromatography(GC)
- Hazardous Waste Characterization Analyses
- Metals by ICP, GFAA and CVAA
- Colorimetric Methods for Metals Speciation
- Inorganic Analyses
- Microbiological Analyses

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Volatle Organics by Gas Chromatography/Mass Spectrometry (GC/MS)

Parameter	Method	Matrix	Minimum Qty. ¹	Recommended Containers(s) ²	Required Preservation	Holding Time ⁸
Volatle Organics	EPA 8260B	Aqueous	40mL	3 x 40mL VOA Vials ¹²	Cool to 4°C ³ HCl to pH <2 ⁴ Remove Chlorine ⁷	14 Days
Volatle Organics	EPA 8260B	Soil	40mL	1 x 40mL VOA Vial with Methanol and 3 x 40mL VOA Vials with Sodium Bisulfate and ¹ unpreserved container for percent moisture	Cool to 4°C ³ Methanol and Sodium Bisulfate	14 Days
Wastewater Volatile Organics	EPA 624	Aqueous	40mL	3 x 40mL VOA Vials ¹²	Cool to 4°C ³ HCl to pH <2 ⁴ Remove Chlorine ⁷	14 Days

Drinking Water Volatile Organics

EPA 524.2

Aqueous 40mL

3 x 40mL VOA Vials¹²

Cool to 4°C³
HCl to pH <2⁴
Remove Chlorine⁷

14 Days

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Volatile Organics by Gas Chromatography (GC)

Parameter	Method	Matrix	Minimum Qty. ¹	Recommended Containers(s) ²	Required Preservation	Holding Time ⁸
Volatile Organics	EPA 8021B	Aqueous	40mL	3 x 40mL VOA Vials ¹²	Cool to 4°C ³ HCl to pH <2 ⁴ Remove Chlorine ⁷	14 Days
Volatile Organics	EPA 8021B	Soil	40mL	1 x 40mL VOA Vial with Methanol and 1 unpreserved container for percent moisture	Cool to 4°C ³ Methanol	14 Days
Wastewater Volatile Organics	EPA 601	Aqueous	40mL	3 x 40mL VOA Vials ¹²	Cool to 4°C ³ Remove Chlorine ⁷	14 Days
Wastewater Volatile Organics	EPA 602	Aqueous	40mL	3 x 40mL VOA Vials ¹²	Cool to 4°C ³ HCl to pH <2 ⁴ Remove Chlorine ⁷	14 Days
Go back to top!						

Semivolatile Organics by Gas Chromatography/Mass Spectrometry (GC/MS)

Parameter	Method	Matrix	Minimum Qty. ¹	Recommended Containers(s) ²	Required Preservation	Holding Time ⁸
Semivolatile Organics	EPA 8270C	Aqueous	1L	2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	Cool to 4°C ³ Remove Chlorine ⁷	7 Days ⁹
Semivolatile Organics	EPA 8270C	Soil	30g	Glass Jar w/teflon liner ¹⁷	Cool to 4°C ³	14 Days ¹⁰
Wastewater Semivolatile Organics	EPA 625	Aqueous	1L	2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	Cool to 4°C ³ Remove Chlorine ⁷	7 Days ⁹

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Pesticides, PCBs and Herbicides by Gas Chromatography (GC)

Parameter	Method	Matrix	Minimum Qty. ¹	Recommended Containers(s) ²	Required Preservation	Holding Time ⁸
Organochlorine Pesticides	EPA 8081A	Aqueous	1L	2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	Cool to 4°C ³ Remove Chlorine ⁷	7 Days ⁹

Organochlorine Pesticides	EPA 8081A	Soil	30g	Glass Jar w/ teflon liner ¹⁷	Cool to 4°C ³	14 Days ¹⁰
PCBs	EPA 8082	Aqueous 1L		2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	Cool to 4°C ³ Remove Chlorine ⁷	7 Days ⁹
PCBs	EPA 8082	Soil	30g	Glass Jar w/ teflon liner ¹⁷	Cool to 4°C ³	14 Days ¹⁰
PCBs in Oil	EPA 8082 Modified	Organic Liquid	5g	1 x 40mL VOA Vial	None	14 Days ¹⁰
EDB and DBCP	EPA 8011	Aqueous 40mL		3 x 40mL VOA Vials ¹²	Cool to 4°C ³ HCl to pH <2 ⁴ Remove Chlorine ⁷	14 Days
EDB in Soil	EPA 8011 Modified	Soil	30g	1 x 60mL Glass Jar w/ septum cap ¹²	Cool to 4°C ³	14 Days
Chlorinated Herbicides	EPA 8151A	Aqueous 1L		2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	Cool to 4°C ³ Remove Chlorine ⁷	7 Days ⁹
Chlorinated Herbicides	EPA 8151A	Soil	30g	Glass Jar w/ teflon liner ¹⁷	Cool to 4°C ³	14 Days ¹⁰
Organophosphorus Pesticides	EPA 8141A	Aqueous 1L		2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	Cool to 4°C ³ Remove Chlorine ⁷	7 Days ⁹
Organophosphorus Pesticides	EPA 8141A	Soil	30g	Glass Jar w/ teflon liner ¹⁷	Cool to 4°C ³	14 Days ¹⁰
Wastewater Organochlorine Pesticides	EPA 608	Aqueous 1L		2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	Cool to 4°C ³ Check pH; Adjust 5-9 ⁶ ; Remove Chlorine ⁷	7 Days ⁹
Wastewater PCBs	EPA 608	Aqueous 1L		2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	Cool to 4°C ³ Remove Chlorine ⁷	7 Days ⁹
Wastewater Chlorinated Herbicides	EPA 615	Aqueous 1L		2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	Cool to 4°C ³ Remove Chlorine ⁷	7 Days ⁹
Drinking Water EDB and DBCP	EPA 504.1	Aqueous 40mL		3 x 40mL VOA Vials ¹²	Cool to 4°C ³ Add Sodium Thiosulfate ²⁶	14 Days
Drinking Water Chlorinated Pesticides	EPA 508.1	Aqueous 1L		2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	HCl to pH <2 ⁴ Cool to 4°C ³ Remove Chlorine ²⁴	14 Days ²²
Drinking Water Herbicides	EPA 515.1	Aqueous 1L		2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	Cool to 4°C ³ Remove Chlorine ⁷	14 Days ²³
Drinking Water Semivolatile Organics	EPA 525.2	Aqueous 1L		2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	HCl to pH <2 ⁴ Cool to 4°C ³ Remove Chlorine ²⁴	14 Days ²²

Drinking Water Carbamate Pesticides	EPA 531.1	Aqueous 60mL	2 x 60mL Glass Vial	Monochloroacetic Acid Buffer at pH 3 Cool to 4°C ³ Remove Chlorine ⁷	28 Days
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Drinking Water Endothall	EPA 548.1	Aqueous 250mL	2 x 500mL Amber Glass Bottle w/teflon liner ¹⁷	Cool to 4°C ³ Add Sodium Thiosulfate ²⁶	14 Days ²¹
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Drinking Water Diquat and Paraquat	EPA 549.2	Aqueous 1L	2 x 1L Black Plastic Bottle	Cool to 4°C ³ Add Sodium Thiosulfate ²⁶	7 Days ²⁷
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Drinking Water Haloacetic Acids (HAAs)	EPA 552.2	Aqueous 40mL	3 x 40mL Amber VOA Vials ¹²	Add NH ₄ Cl Cool to 4°C ³ Add Sodium Thiosulfate ²⁶	14 Days ²⁸
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Petroleum Hydrocarbons by Gas Chromatography(GC)

Parameter	Method	Matrix	Minimum Qty. ¹	Recommended Containers(s) ²	Required Preservation	Holding Time ⁸
Hydrocarbon Fingerprint	ASTM D3328- 90	Aqueous	1L	2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	Cool to 4°C ³ H ₂ SO ₄ to pH <2 ¹³	7 Days ⁹
Hydrocarbon Fingerprint	ASTM D3328- 90	Soil	30g	Glass Jar w/ teflon liner ¹⁷	Cool to 4°C ³	14 Days ¹⁰
TPH by (GC/ FID)	EPA 8100 Modified	Aqueous	1L	2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	Cool to 4°C ³ H ₂ SO ₄ to pH <2 ¹³	7 Days ⁹
TPH by (GC/ FID)	EPA 8100 Modified	Soil	30g	Glass Jar w/ teflon liner ¹⁷	Cool to 4°C ³	14 Days ¹⁰
API DRO	EPA 8100 Modified	Aqueous	1L	2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	Cool to 4°C ³ H ₂ SO ₄ to pH <2 ¹³	7 Days ⁹
API DRO	EPA 8100 Modified	Soil	30g	Glass Jar w/ teflon liner ¹⁷	Cool to 4°C ³	14 Days ¹⁰
API GRO	EPA 8015 Modified	Aqueous	40mL	3 x 40mL VOA Vials ¹²	Cool to 4°C ³ HCl to pH <2 ⁴	14 Days
API GRO	EPA 8015 Modified	Soil	40mL	1 x 40mL VOA Vial with Methanol and 1 unpreserved container for percent moisture	Cool to 4°C ³ Methanol	14 Days
CT ETPH	CT ETPH	Aqueous	1L	2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	Cool to 4°C ³	7 Days ⁹

CT ETPH	CT ETPH	Soil	30g	Glass Jar w/ teflon liner ¹⁷	Cool to 4°C ³	14 Days ¹⁰
ME DRO	ME 4.1.25	Aqueous	1L	2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	Cool to 4°C ³ H ₂ SO ₄ to pH <2 ¹³	7 Days ⁹
ME DRO	ME 4.1.25	Soil	30g	Glass Jar w/ teflon liner ¹⁷	Cool to 4°C ³	14 Days ¹⁰
ME GRO	ME 4.2.17	Aqueous	40mL	3 x 40mL VOA Vials ¹²	Cool to 4°C ³ HCl to pH <2 ⁴	14 Days
ME GRO	ME 4.2.17	Soil	40mL	1 x 40mL VOA Vial with Methanol and 1 unpreserved container for percent moisture	Cool to 4°C ³ Methanol	14 Days
MA DEP VPH	MA DEP VPH 2004	Aqueous	40mL	3 x 40mL VOA Vials ¹²	Cool to 4°C ³ HCl to pH <2 ⁴	14 Days
MA DEP VPH	MA DEP VPH 2004	Soil	40mL	1 x 40mL VOA Vial with Methanol and 1 unpreserved container for percent moisture	Cool to 4°C ³ Methanol	28 Days
MA DEP EPH	MA DEP EPH 2004	Aqueous	1L	2 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	Cool to 4°C ³ H ₂ SO ₄ to pH <2 ¹³	14 Days ¹⁰
MA DEP EPH	MA DEP EPH 2004	Soil	30g	Glass Jar w/ teflon liner ¹⁷	Cool to 4°C ³	14 Days ¹⁰

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Hazardous Waste Characterization Analyses

Parameter	Method	Matrix	Minimum Qty. ¹	Recommended Containers(s) ²	Required Preservation	Holding Time ⁸
TCLP/SPLP Volatile Organics	EPA 1311/1312 EPA 8260B	Solid ¹⁸	150g	2 x 125mL Glass Vial w/ teflon septum cap ¹⁶	Cool to 4°C ³	14 Days ¹⁹
TCLP/SPLP Metals, Semivolatiles, Pesticides and Herbicides	EPA 1311/1312 EPA 6010B/7470A EPA 8270C EPA 8081A EPA 8151A	Solid ¹⁸	300g	Glass Jar w/ teflon liner ¹⁷	Cool to 4°C ³	28 Days ¹⁹ 14 Days ¹⁹
Ignitability	EPA 1010 Modified	Solid	50g	Glass or Plastic Jar	None	None
Corrosivity (as pH)	EPA 9045C	Solid	50g	Glass or Plastic Jar	Cool to 4°C ³	None
Reactivity	SW-846	Solid	50g	Glass or Plastic Jar	Cool to 4°C ³	None

Free Liquids EPA 9095 Solid 100g Glass or Plastic Jar None None

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Metals by ICP, GFAA and CVAA

Parameter	Method	Matrix	Minimum Qty. ¹	Recommended Containers(s) ²	Required Preservation	Holding Time ⁸
Total Metals (except Mercury)	EPA 6010B	Aqueous	100mL	Plastic Bottle	HNO ₃ to pH <2	180 Days
Dissolved Metals (except Mercury)	EPA 6010B	Aqueous	100mL	Plastic Bottle	Filter First ¹¹ HNO ₃ to pH <2	180 Days
Total Metals (except Mercury)	EPA 6010B	Soil	15g	Glass or Plastic Bottle	Cool to 4°C ³	180 Days
Total Mercury	EPA 7470A	Aqueous	100mL	Plastic Bottle	HNO ₃ to pH <2	28 Days
Dissolved Mercury	EPA 7470A	Aqueous	100mL	Plastic Bottle	Filter First ¹¹ HNO ₃ to pH <2	28 Days
Total Mercury	EPA 7471A	Soil	15g	Glass or Plastic Bottle	Cool to 4°C ³	28 Days
Wastewater and Drinking Water Total Metals (except Mercury)	EPA 200.7	Aqueous	100mL	Plastic Bottle	HNO ₃ to pH <2	180 Days
Wastewater Dissolved Metals (except Mercury)	EPA 200.7	Aqueous	100mL	Plastic Bottle	Filter First ¹¹ HNO ₃ to pH <2	180 Days
Wastewater and Drinking Water Total Mercury	EPA 245.1	Aqueous	100mL	Plastic Bottle	HNO ₃ to pH <2	28 Days
Wastewater Dissolved Mercury	EPA 245.1	Aqueous	100mL	Plastic Bottle	Filter First ¹¹ HNO ₃ to pH <2	28 Days

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Colorimetric Methods for Metals Speciation

Parameter	Method	Matrix	Minimum Qty. ¹	Recommended Containers(s) ²	Required Preservation	Holding Time ⁸
Chromium, Hexavalent	SM 3500-Cr D EPA 7196A	Aqueous	100mL	Plastic Bottle	Cool to 4°C ³	24 Hours

Chromium, Hexavalent	EPA 7196A	Soil	15g	Glass or Plastic Bottle	Cool to 4°C ³	30 Days
Iron, Ferrous	SM 3500-Fe D	Aqueous	100mL	Plastic Bottle	None	Analyze Immediately

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Inorganic Analyses

Parameter	Method	Matrix	Minimum Qty. ¹	Recommended Containers(s) ²	Required Preservation	Holding Time ³
Acidity	SM 2310 B	Aqueous	100mL	Plastic or Glass Bottle	Cool to 4°C ³	14 Days
Alkalinity	SM 2320 B EPA 310.2	Aqueous	100mL	Plastic or Glass Bottle	Cool to 4°C ³	14 Days
BOD	SM 5210 B	Aqueous	1L	Plastic or Glass Bottle	Cool to 4°C ³	48 Hours
CBOD	SM 5210 B EPA 325.2	Aqueous	1L	Plastic or Glass Bottle	Cool to 4°C ³	48 Hours
Chloride	EPA 300.0 EPA 9251	Aqueous	50mL	Plastic or Glass Bottle	None	28 Days
Chlorine, Total Residual	SM 4500-Cl G	Aqueous	200mL	Plastic or Glass Bottle	None	Analyze Immediately
Chemical Oxygen Demand (COD)	SM 5220 D	Aqueous	50mL	Plastic or Glass Bottle	H2SO4 to pH <2 Cool to 4°C ³	28 Days
Color	SM 2120 B	Aqueous	50mL	Plastic or Glass Bottle	Cool to 4°C ³	48 Hours
Cyanide, Amenable to Chlorination	EPA 335.1	Aqueous	500mL	Plastic or Glass Bottle	Remove Sulfide ¹⁴ NaOH to pH >12 Cool to 4°C ³	14 Days
Cyanide, Total	EPA 335.3 EPA 335.4 EPA 9012A	Aqueous	500mL	Plastic or Glass Bottle	Remove Sulfide ¹⁴ NaOH to pH >12 Cool to 4°C ³	14 Days
Fluoride	SM 4500-F C EPA 300.0	Aqueous	300mL	Plastic Bottle Only	None	28 Days
MBAS (Surfactants)	SM 5540 C	Aqueous	250mL	Plastic or Glass Bottle	Cool to 4°C ³	48 Hours

Nitrogen, Ammonia	SM 4500-NH3 G	Aqueous 4 00mL	Plastic or Glass Bottle	H2SO4 to pH <2 Cool to 4°C3	28 Days
Nitrogen, Nitrate	SM 4500-NO3 F EPA 300.0	Aqueous 100mL	Plastic or Glass Bottle	Cool to 4°C3	48 Hours
Nitrogen, Nitrate (Chlorinated Drinking Water)	SM 4500-NO3 F EPA 300.0	Aqueous 100mL	Plastic or Glass Bottle	Cool to 4°C3	14 Days
Nitrogen, Nitrite	SM 4500-NO3 F EPA 300.0	Aqueous 100mL	Plastic or Glass Bottle	Cool to 4°C3	48 Hours
Nitrogen, Nitrate plus Nitrate	SM 4500-NO3 F EPA 300.0	Aqueous 100mL	Plastic or Glass Bottle	H2SO4 to pH <2 Cool to 4°C3	28 Days
Nitrogen, Total Kjeldahl (TKN)	EPA 351.2	Aqueous 500mL	Plastic or Glass Bottle	H2SO4 to pH <2 Cool to 4°C3	28 Days
Odor	SM 2150 B	Aqueous 200mL	Glass Bottle Only	Cool to 4°C3	24 Hours
Oil and Grease, Gravimetric	SM 5520 B EPA 1664 EPA 9070	Aqueous 1L	1 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	H2SO4 to pH <2 ¹³ Cool to 4°C3	28 Days
Organic Carbon, Total (TOC)	SM 5310 B EPA 9060	Aqueous 25mL	Plastic or Glass Bottle	H2SO4 to pH <2 Cool to 4°C3	28 Days
Oxygen, Dissolved	SM 4500-O G	Aqueous 300mL	Glass Bottle Only	None	Analyze Immediately
pH	SM 4500-H + B EPA 9040B	Aqueous 25mL	Plastic or Glass Bottle	None	Analyze Immediately
Petroleum Hydrocarbons, Total (TPH-IR)	SM 5520 CF	Aqueous 1L	1 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	H2SO4 to pH <2 ¹³ Cool to 4°C3	28 Days
Phenolics, Total	EPA 420.2 EPA 9066	Aqueous 500mL	1 x 1L Amber Glass Bottle w/ teflon liner ¹⁷	H2SO4 to pH <2 Cool to 4°C3	28 Days
Phosphate, Ortho	SM 4500-P F	Aqueous 50mL	Glass Bottle Only	Filter (0.45 µm) Cool to 4°C3	48 Hours
Phosphorus, Total	SM 4500-P F	Aqueous 50mL	Plastic or Glass Bottle	H2SO4 to pH <2 Cool to 4°C3	28 Days

Phosphorus, Total (Low-level 0.005 mg/L)	SM 4500-P E	Aqueous 50mL	Plastic or Glass Bottle	H2SO4 to pH <2 Cool to 4°C ³	28 Days
Solids, Settleable (SS)	SM 2540 F	Aqueous 1L	Plastic or Glass Bottle	Cool to 4°C ³	48 Hours
Solids, Total (TS)	SM 2540 B	Aqueous 100mL	Plastic or Glass Bottle	Cool to 4°C ³	7 Days
Solids, Total Dissolved (TDS)	SM 2540 C	Aqueous 100mL	Plastic or Glass Bottle	Cool to 4°C ³	7 Days
Solids, Total Suspended (TSS)	SM 2540 D	Aqueous 100mL	Plastic or Glass Bottle	Cool to 4°C ³	7 Days
Solids, Total Volatile (TVS)	SM 2540 E	Aqueous 100mL	Plastic or Glass Bottle	Cool to 4°C ³	7 Days
Solids, Volatile Suspended (VSS)	SM 2540 E	Aqueous 100mL	Plastic or Glass Bottle	Cool to 4°C ³	7 Days
Solids, Volatile Dissolved (VDS)	EPA 2540 E	Aqueous 100mL	Plastic or Glass Bottle	Cool to 4°C ³	7 Days
Specific Conductance	SM 2510B EPA 9050A	Aqueous 100mL	Plastic or Glass Bottle	Cool to 4°C ³	28 Days
Sulfate	SM 4500-SO4 F EPA 300.0 EPA 9056	Aqueous 50mL	Plastic or Glass Bottle	Cool to 4°C ³	28 Days
Sulfide	SM 4500-S2 D	Aqueous 500mL	Plastic or Glass Bottle	NaOH to pH >9.2mL Zinc Acetate Cool to 4°C ³	7 Days
Turbidity	SM 2130 D	Aqueous 100mL	Plastic or Glass Bottle	Cool to 4°C ³	48 Hours

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Microbiological Analyses

Parameter	Method	Matrix	Minimum Qty. ¹	Recommended Containers(s) ²	Required Preservation	Holding Time ⁶
Wastewater Total Coliform (Membrane Filtration)	SM 9222 B	Aqueous	100mL	Sterilized Bottle	Cool to 4°C ³ Remove Chlorine ⁷	6 Hours
Wastewater Fecal Coliform (Membrane Filtration)	SM 9222 D	Aqueous	100mL	Sterilized Bottle	Cool to 4°C ³ Remove Chlorine ⁷	6 Hours

Drinking Water Total Coliform (Membrane Filtration)	SM 9222 B	Aqueous 100mL	Sterilized Bottle	Cool to 4°C ³ Remove Chlorine ⁷	30 Hours
Drinking Water Total Coliform (ColiIert)	SM 9223 B	Aqueous 100mL	Sterilized Bottle	Cool to 4°C ³ Remove Chlorine ⁷	30 Hours
Drinking Water Fecal Coliform (Membrane Filtration)	SM 9222 D	Aqueous 100mL	Sterilized Bottle	Cool to 4°C ³ Remove Chlorine ⁷	30 Hours
Drinking Water E. Coli	SM 9222 SM 9223	Aqueous 100mL	Sterilized Bottle	Cool to 4°C ³ Remove Chlorine ⁷	30 Hours
Heterotrophic Plate Count (Standard Plate Count)	SM 9215	Aqueous 100mL	Sterilized Bottle	Cool to 4°C ³ Remove Chlorine ⁷	30 Hours

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Sampling Notes

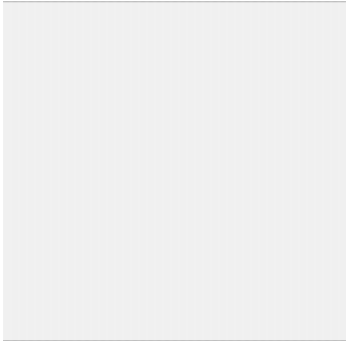
1. The minimum quantity specified is the minimum amount of sample material necessary to perform the analysis. This quantity allows for no margin of error. For some analyses, Groundwater Analytical recommends specific types and numbers of containers (e.g., an Aqueous Volatile Organic sample requires 3 x 40mL Glass Vials w/teflon septum caps). In such cases, the recommended container(s) allow for an adequate margin of error. For other analyses, Groundwater Analytical only recommends a general type of container (e.g., a Solid Semivolatile Organic sample requires a Glass Jar w/ teflon liner). In such cases, it is strongly recommended that twice the minimum quantity of sample material be collected in the recommended type of container. For solid samples, in addition to the minimum quantities required for individual analyses, each sample also requires 20g of sample material for a percent solids (or percent moisture) determination. Example: A soil sample collected for TPH-IR (30g), 8 RCRA Metals (2.6g) and PCBs (30g) requires a minimum of 62.6g of material for the desired analyses, and 20g of material for percent solids (or percent moisture), for a total required minimum of 82.6g of material. It is then recommended that this minimum be doubled, and at least 165.2g of sample material be collected in a Glass Jar w/teflon liner. For solid samples, all minimum quantities are calculated net of all foreign objects, such as sticks, leaves and rocks.
2. Only sample containers pre-cleaned according to US EPA protocols are recommended. Appropriate pre-cleaned and pre-preserved containers are available from Groundwater Analytical. Pre-cleaned sample containers should **not** be pre-rinsed with sample prior to sample collection. Pre-rinsing may cause elevated results.
3. Samples should be immediately cooled, stored and shipped refrigerated. 4°C (34°F) is the recommended temperature for most analyses. Refrigeration retards biological degradation, reduces the volatility of compounds, retards

the hydrolysis of non-aqueous compounds, reduces absorption effects and prevents continuing chemical reactions.

4. Adjust to pH <2 with Hydrochloric Acid (HCl). Acidification retards biological action, reduces absorption effects and prevents the formation of precipitates and/or complexes. Sulfuric Acid (H₂SO₄) or Sodium Bisulfate (NaHSO₄) may be substituted for HCl in EPA Methods 8021B, 8011, and 8260B.
5. Adjust to a pH range of 4.0 to 5.0 with Hydrochloric Acid (HCl), Sulfuric Acid (H₂SO₄) or Sodium Hydroxide (NaOH).
6. If sample will not be received by laboratory within 24 hours of collection, then adjust to specified pH range with Sulfuric Acid (H₂SO₄) or Sodium Hydroxide (NaOH). The pH adjustment may be omitted if it is performed upon receipt at the laboratory within 24 hours, and may be omitted if the sample is extracted within 48 hours of collection.
7. If free chlorine is present in the sample, then Sodium Thiosulfate (Na₂S₂O₃) should be added. Free chlorine can react with organic compounds to form chlorination by-products. Free chlorine is likely to be found in chlorinated municipal drinking waters and treated wastewaters. Sodium Thiosulfate, a reducing agent, is added to remove the free chlorine. For most levels of free chlorine, add 4 drops of 10% Sodium Thiosulfate to samples in 40mL vials, and add 5mL of 10% Sodium Thiosulfate to samples in 1L bottles.
8. The listed Holding Time is the maximum time a sample may be held between collection and initiation of analysis or extraction.
9. Samples must be extracted within 7 days of collection. Extracts must then be analyzed within 40 days of extraction.
10. Samples must be extracted within 14 days of collection. Extracts must then be analyzed within 40 days of extraction.
11. Samples for dissolved metals must be filtered **prior** to preservation with Nitric Acid (HNO₃). Filtration **must** be done with a 0.45 micron membrane filter.
Field filtration and preservation is preferred.
However, if field filtration is not possible, samples should be cooled at 4°C and shipped to the laboratory for filtration and preservation. Filtration must be done as soon as practical after collection. Groundwater Analytical recommends that filtration be done within 24 hours of collection. If samples are not going to be field filtered, do **not** preserve samples with Nitric Acid (HNO₃).
12. Aqueous samples for Volatile Organic Analyses (VOA) must be collected without any headspace or air bubbles. Volatile organics dissolved in water tend to volatilize readily and will fill any air bubble available in the vial. Particularly with low level samples, this results in a loss of material upon opening the vial. VOA vials must be filled slowly until the liquid forms a meniscus on the rim of the vial. The cap should then be gently placed on the vial, taking care not to disturb the crown of liquid, and firmly rotated tight. The vial should then be examined to verify the absence of all air bubbles.
13. Adjust to pH <2 with Sulfuric Acid (H₂SO₄). Alternatively, Hydrochloric Acid (HCl) may be used.
14. Maximum holding time is 24 hours when Sulfide is present. Samples may be tested with lead acetate paper before the pH adjustment in order to determine

if Sulfide is present. If Sulfide is present, it can be removed by the addition of Cadmium Nitrate powder until a negative spot test is obtained. The sample is then filtered, and NaOH is added to adjust the pH >12.

15. Adjust to pH <2 with Nitric Acid (HNO₃) or Sulfuric Acid (H₂SO₄). Acidification retards biological action, reduces absorption effects and prevents the formation of precipitates and/or complexes.
16. Samples should be collected with a minimum of aeration. The sample bottle should be filled completely, excluding all headspace, and capped.
17. Extractable organic samples are susceptible to Phthalate ester contamination. Phthalate ester contamination is generally caused by sample contact with a plastic material, particularly flexible plastics. Use care to avoid sample contact with any plastic, other than Teflon.
18. Specified quantities of sample material are for **only** single phase solid samples (i.e. no free liquids). Liquid phase or multiple phase samples require different quantities of sample material. Contact laboratory for advice prior to collecting liquid phase or multiple phase samples for TCLP analyses.
19. Samples for TCLP Volatile Organics analysis must be leached within 14 days of collection. The leachate must then be analyzed within 14 days of leaching. Samples for TCLP Metals analysis must be leached within 28 days of collection, if Mercury is being analyzed. The leachate must then be analyzed within 28 days of leaching. If Mercury is **not** being analyzed, then samples for TCLP Metals must be leached within 180 days of collection, and the leachate analyzed within 180 days of leaching. Samples for TCLP Semivolatile Organics, TCLP Pesticides, and TCLP Herbicides analyses must be leached within 14 days of collection. The leachate must then be extracted within 7 days of leaching. The extract must then be analyzed within 40 days of extraction.
20. Samples must be analyzed within 7 days of collection. However, if Heptachlor is not being determined, sample holding time to analysis may be extended to 14 days.
21. Samples must be extracted within 7 days of collection. Extracts must then be analyzed within 14 days of extraction.
22. Samples must be extracted within 14 days of collection. Extracts must then be analyzed within 30 days of extraction.
23. Samples must be extracted within 14 days of collection. Extracts must then be analyzed within 28 days of extraction.
24. Add 40-50mg of Sodium Sulfite to each liter of sample to reduce free chlorine that may be present. Free chlorine can react with organic compounds to form chlorination by-products. Free chlorine is likely to be found in chlorinated municipal drinking waters and treated wastewaters. Alternatively, use 40-50mg of Sodium Arsenite. Do not use Sodium Thiosulfate, as it may produce a residue of elemental sulfur which may interfere with the determination of some analytes.
25. Samples must be extracted within 7 days of collection. Extracts must then be analyzed within 30 days of extraction.
26. Add Sodium Thiosulfate to reduce free chlorine that may be present. Free chlorine can react with organic compounds to form chlorination by-products. Free chlorine is likely to be found in chlorinated municipal drinking waters.



- Use approximately 80mg of Sodium Thiosulfate per liter of sample.
- 27. Samples must be extracted within 7 days of collection. Extracts must then be analyzed within 21 days of extraction.
 - 28. Samples must be extracted within 14 days of collection. Extracts must then be analyzed within 7 days of extraction.

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COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION

STANDARD REFERENCES FOR MONITORING WELLS

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